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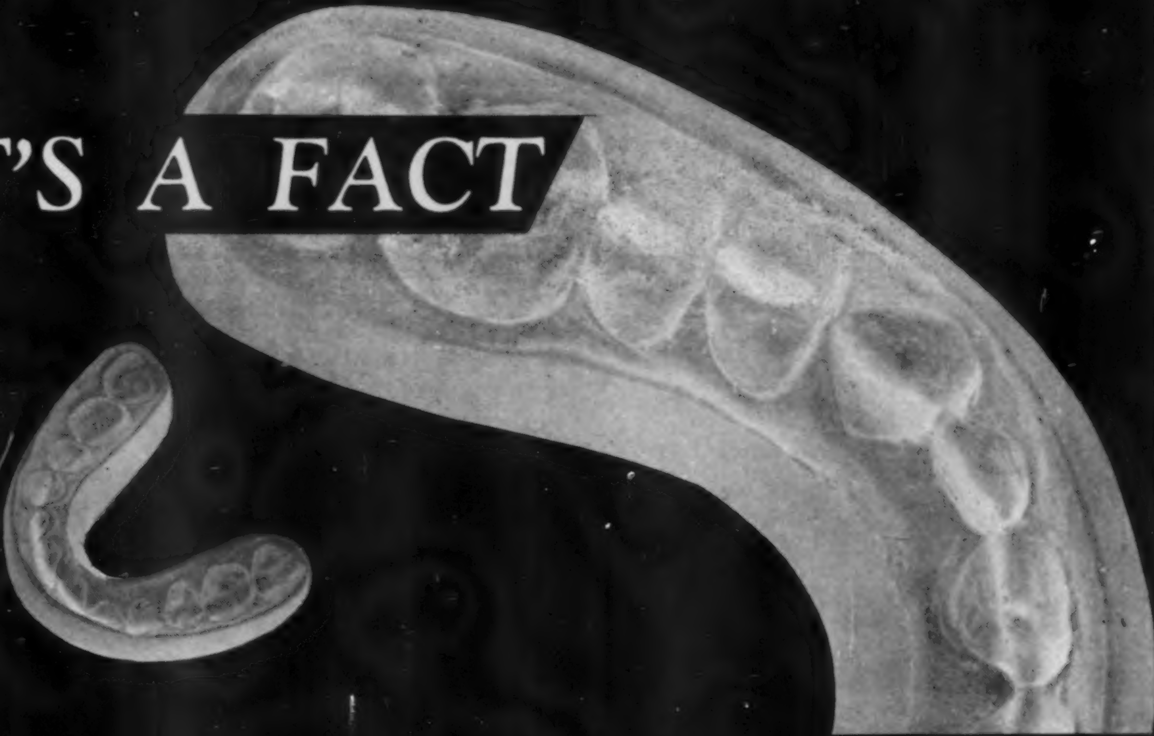

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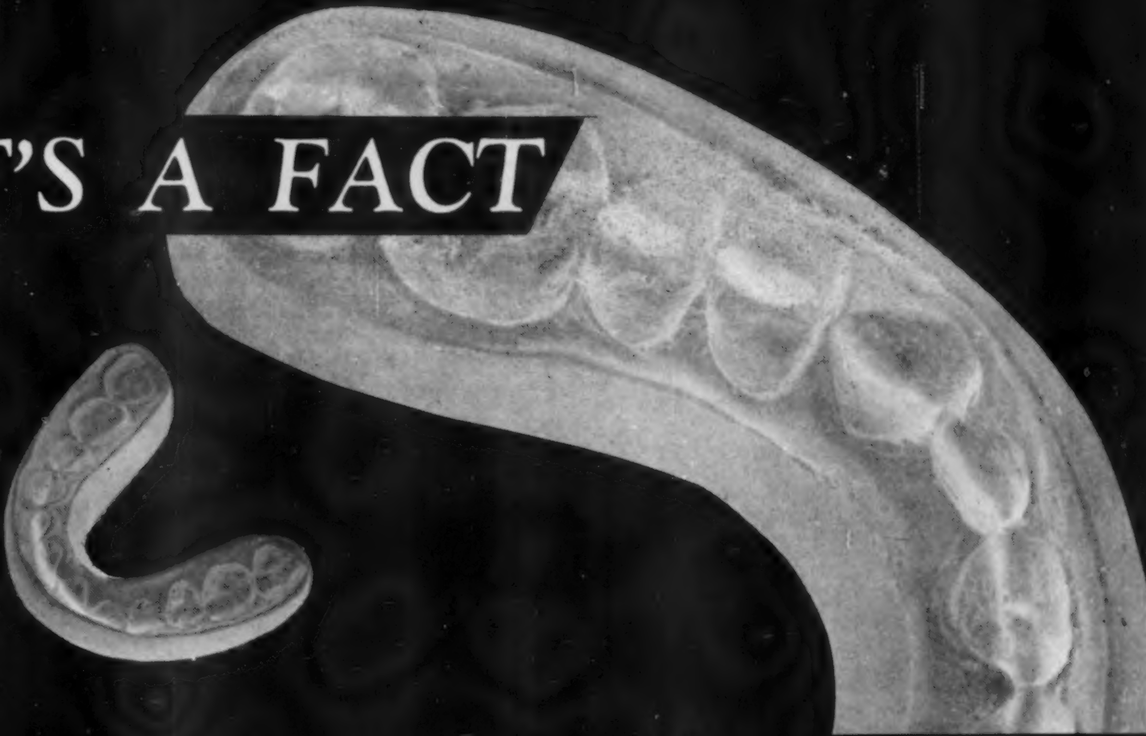

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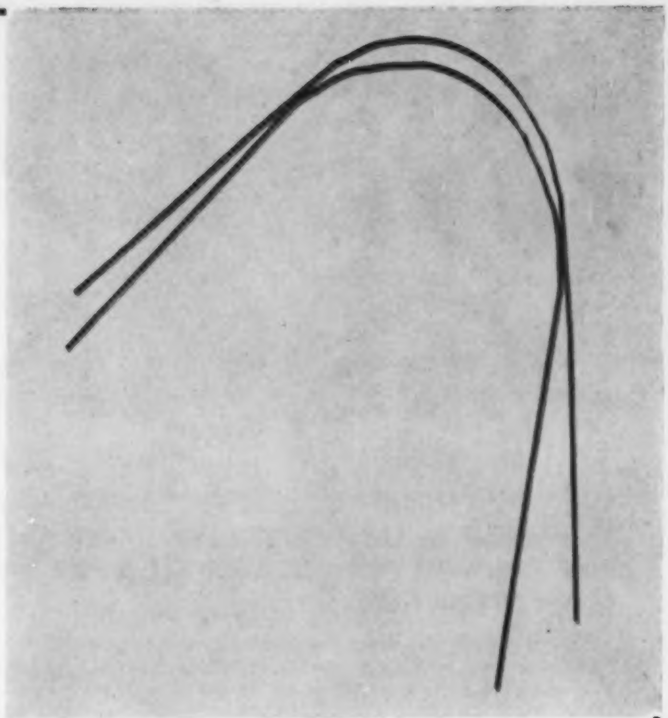

American Journal
of
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Original Articles

WIDTH OF THE NASOPHARYNX AND RELATED ANATOMIC STRUCTURES IN NORMAL AND UNOPERATED CLEFT PALATE CHILDREN

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THE nasal-pharyngeal area in man is one of great complexity, involving as it does structures that are intimately concerned with the important functions of mastication, deglutition, respiration, olfaction, and speech. Each of these functions makes its own specific demands on the parts, and yet all must work synergistically at times. Adding further to the complexity, this area exhibits one of the widest ranges of variation in growth rates. The nose, nasopharynx, and soft palate are ready to function at birth, whereas the maxilla must undergo an average of eighteen years of growth for complete development.

Important though this entire area is, numerous controversial opinions regarding the comparative size of the nasopharynx in normal and cleft palate persons have been expressed.[1-6] However, adequate means for measuring its width dimension in the living have not been available until recently. Cephalometric laminagraphy, essentially a body-sectioning technique, has fulfilled this technological need and was employed in this study to measure objectively the width dimensions of the nasopharyngeal area.

The medial pterygoid plates of the sphenoid bone were selected to delineate anatomically the lateral margins of the nasopharynx. These plates function as a bony scaffolding and offer the anterolateral attachment for the superior

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Based on a thesis submitted in partial fulfillment of the requirements for a Master of Science degree, Department of Orthodontia, University of Illinois.

This article received honorable mention in the 1954 Prize Essay Contest of the American Association of Orthodontists.

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portion of the muscular pharynx. The medial pterygoid plates serve also as the posterior superior attachment for the buccinator muscle which sweeps forward completely around the alveolar process and teeth.

Thus, the anatomic and physiologic significance of the medial pterygoid plates is recognized and the study was undertaken in an attempt to provide at least partial answers to the following questions:

1. What are the normal lateral dimensions of the nasopharynx as determined by the distance between the medial pterygoid plates in infancy and childhood?
2. Is the nasopharynx wider in this dimension in cleft palate patients than in noncleft palate patients?
3. If there is an aberration in the nasopharyngeal width in cleft palate patients, are there accompanying aberrations in adjacent structures, such as the maxillae?

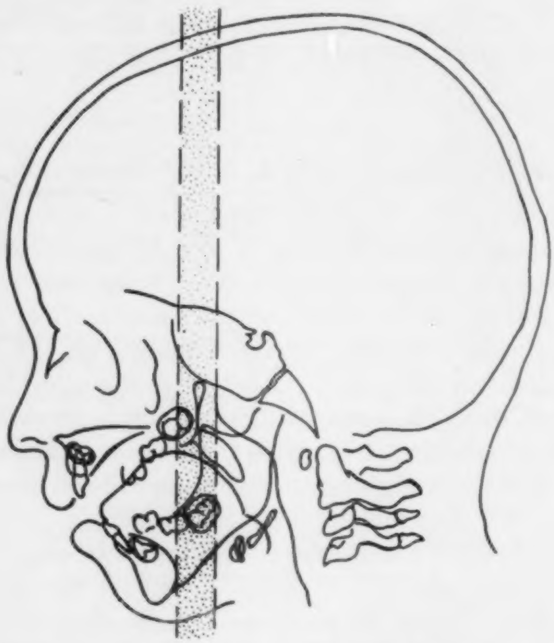

Fig. 1.—Lateral headplate tracing with stippled section indicating the desired lamina passing through the pterygomaxillary fissure and adjacent areas.

METHODS AND MATERIALS

To investigate these major areas, 142 children under 3 years of age were examined by cephalometric laminagraphy. This included ninety-one unoperated cleft palate cases and fifty-one noncleft palate cases.

Cephalometric laminagraphy, developed by Brader,[7] affords clear definition of structures in a common plane which are obscured in the conventional roentgenograms by the superposing of denser structures.

It was decided that the best level at which determinations could be made would be the frontal plane passing through the pterygomaxillary fissure (Fig. 1). This marks the junction between the posterior ends of the maxillary arch and the pterygoid processes, both of which it was desired to study. Furthermore, it is located rather easily in the living infant, as it is palpable through the vestibule of the mouth. The next problem was to relate this junction with some stable landmark on the exterior of the head. For this purpose, an instrument was devised which made it possible to relate the pterygomaxillary fissure to the earhole (Fig. 2).

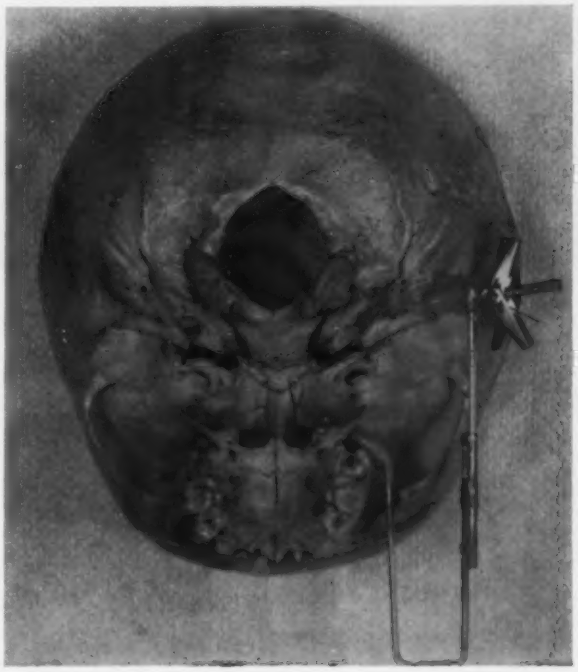

Fig. 2.—Inferior view of a child's skull with the instrument positioned to determine the distance from the pterygomaxillary fissure to the earhole.

All infants were sedated to insure immobility during exposure. A barbiturate, administered rectally, was the sedative of choice. The child was laid on its back on the table top, facing the target. To maintain the head in the Frankfort horizontal plane during exposure, a special head holder was provided (Fig. 3). After the infant was correctly positioned in the head holder, the distance of the earhole above the table top was read on the calibrated scale marked on the ear post holder. To this was added the measurement previously derived from the device which located the pterygomaxillary fissure in relation to the earhole. The fulcrum level was adjusted to the desired level of the cut, and the laminagram was made. After the film was processed, it was covered with transparent acetate paper and all anatomical structures were traced (Fig. 4).

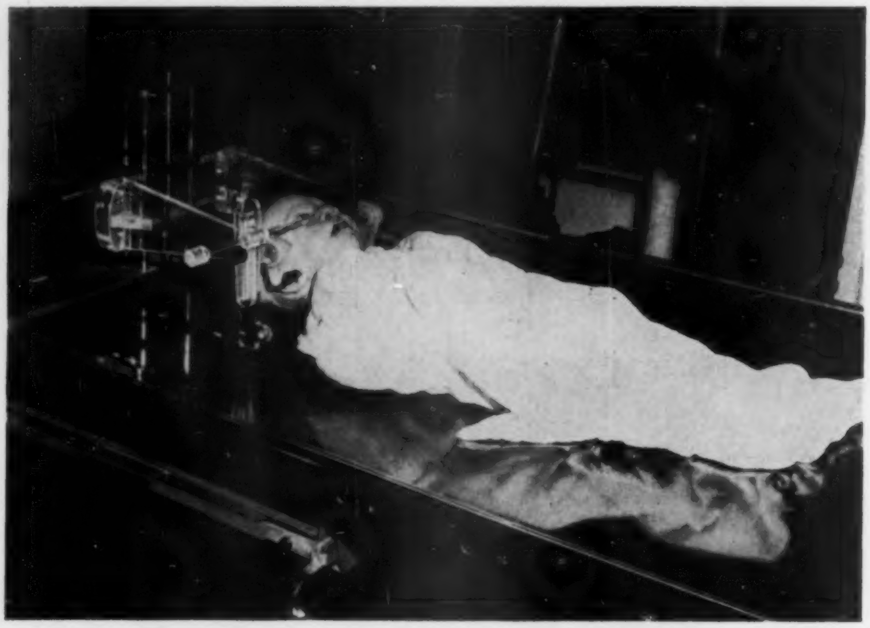

Fig. 3.—A sedated child laid on its back on the laminagraph table top facing the anode. The child's head is positioned within the special head holder.

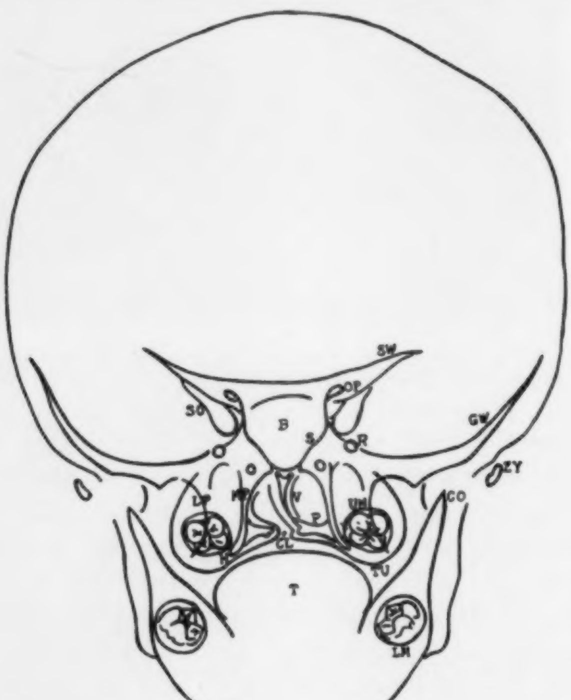

Fig. 4.—Tracing of a laminagram revealing the following anatomic structures: *SW*, small wing of the sphenoid; *OP*, optic foramen; *SO*, superior orbital fissure; *B*, body of sphenoid; *R*, foramen rotundum; *GW*, great wing of the sphenoid; *S*, suture between body and pterygoid process and great wing of the sphenoid; *LP*, lateral pterygoid plate; *MP*, medial pterygoid plate; *H*, hamular process or inferior tip of the medial pterygoid plate; *CL*, cleft; *V*, vomer; *P*, horizontal plate of palatine bone; *UM*, maxillary first permanent molar; *TU*, tuberosity; *T*, tongue; *LM*, mandibular first permanent molar; *CO*, coronoid process; *ZY*, zygomatic arch.

Correctional scales cut from each film were utilized and the following linear and angular measurements were determined:

A. *Linear Measurements* (*Fig. 5*):

1. The distance between the inferior tips of the medial pterygoid plates (bihamular measurement).
2. The distance between the centers of the tooth germs of the maxillary first permanent molars.
3. The distance between the lateral margins of each foramen rotundum (birotundum width).
4. The distance between the lateral margins of the zygomatic arches.

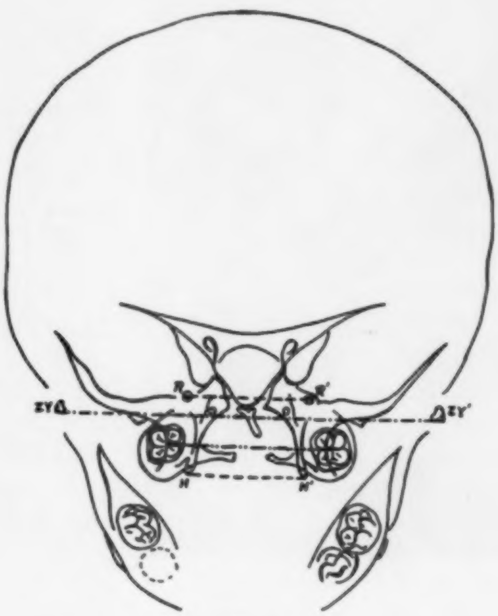

Fig. 5.

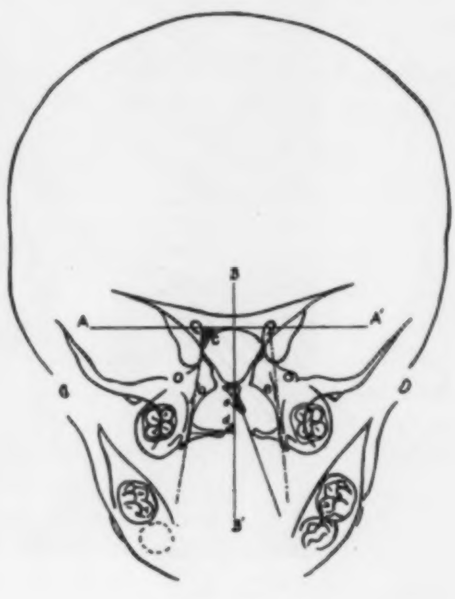

Fig. 6.

Fig. 5.—Linear measurements. *HH'*, Bihamular measurement; the line above *HH'*, bimaxillary first permanent molar measurement; *ZY-ZY'*, bizygomatic measurement; *R-R'*, birotundal measurement.

Fig. 6.—Angular measurement. *AA'* Cranial base line; *BB'*, perpendicular to cranial base; Angle *C*, inclination of the medial pterygoid plate in relation to the cranial base; Angle *E*, deviation of the vomer bone from the perpendicular; Angle *D*, inclination of the palatal plate. A subtraction of 90 degrees indicates the degree of deviation from the cranial base.

B. *Angular Measurements* (*Fig. 6*):

1. The angular inclination of the medial pterygoid plates to the cranial base. The cranial base line was drawn through two points representing the center of each respective optic foramen. These points were chosen by inspection, as is done with sella turcica in the lateral head plate.[8] Lines were drawn paralleling the downward projection of the medial pterygoid plates to measure their inclinations to the cranial base plane.

2. The inclination of the vomer in reference to a perpendicular drawn from the cranial base line.
3. The inclination of the palatal plates in the area of the maxillary tuberosities. The angular relationship of the palatal shelf to the cranial base was determined.

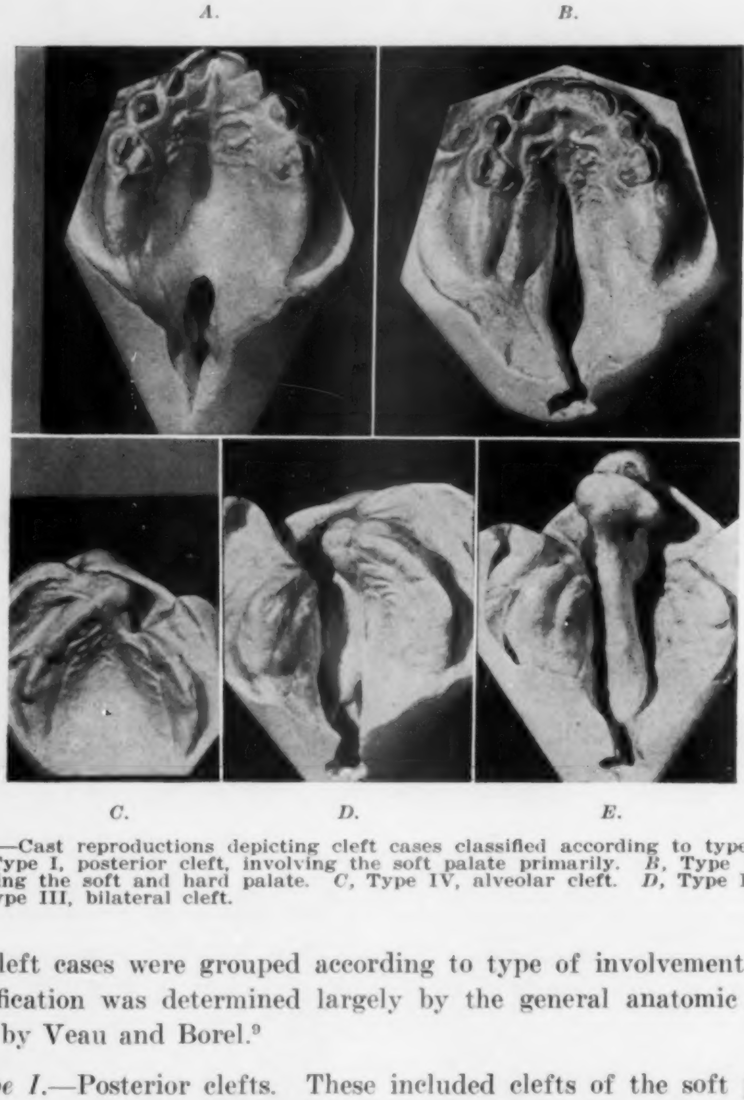

Fig. 7.—Cast reproductions depicting cleft cases classified according to type of involvement: *A*, Type I, posterior cleft, involving the soft palate primarily. *B*, Type I, posterior cleft, involving the soft and hard palate. *C*, Type IV, alveolar cleft. *D*, Type II, unilateral cleft. *E*, Type III, bilateral cleft.

The cleft cases were grouped according to type of involvement (Fig. 7). The classification was determined largely by the general anatomic categories advocated by Veau and Borel.[9]

Type I.—Posterior clefts. These included clefts of the soft palate only, as well as clefts of the soft palate and the vault of the hard palate without an associated cleft of the alveolar process or of the lip.

Type II.—Unilateral clefts. These included clefts of the lip and palate which occurred on either side of the face and involved a fusion of one of the palatine processes with the inferior border of the nasal septum.

Type III.—Bilateral clefts. These involved the lip and palate, and presented the premaxillary segment completely separated from the lateral palatine processes. There is no fusion of the palatine processes with the inferior border of the nasal septum.

Type IV.—Alveolar clefts. This type was added to Veau's classification because it was encountered in the sample with sufficient frequency to deserve a separate group and designation. The clefts of Type IV, then, may be defined as clefts of the alveolar process of varying degree of severity which are usually associated with a cleft lip. A cleft in this group may or may not extend posteriorly as a hidden or submucous cleft.

After selective diagnosis, the group of Type I, posterior clefts, consisted of twenty-nine cases; Type II, unilateral clefts, included thirty-six cases; Type III, bilateral clefts, included thirteen; and Type IV, alveolar clefts, all of which had associated congenital cleft lip, included thirteen cases. All partial or complete clefts of the palate or alveolus were unoperated.

The noncleft population, as well as the cleft population, were grouped with respect to age. The one-year age interval was considered reasonable and afforded some degree of control over growth and developmental gradients. It also provided more homogenous groupings for matching with noncleft groups and other cleft or group types. Although this age interval proved most advantageous for certain types of analysis, it was necessary to dispense with age grouping in analyzing variations which were observed within the gross cleft population. The comparatively small size of the bilateral and alveolar cleft groups seemed to justify this procedure.

FINDINGS

1. *Bihamular Measurements.*—Bihamular measurements were taken to determine what differences, if any, existed between normal and cleft palate children in the width of the posterior choanae at the level of the palate. Because the cleft palate patients studied were all infants of 3 years or less, it was necessary to employ a control sample of the same age. Furthermore, it was deemed advisable to divide both samples, according to age, by yearly intervals in order to make allowance for growth.

Controls: This group consisted of fifty-one children ranging from 11 days of age to 3 years 2 weeks of age. Group I consisted of eighteen patients under 1 year of age; Group II consisted of eighteen patients between 1 and 2 years of age; and Group III consisted of fifteen patients between 2 and 3 years of age.

Analysis of each of the three groups yielded the following mean bihamular dimensions: Group I, 22.61 mm., S.D. 2.91; Group II, 25.5 mm., S.D. 2.38; Group III, 25.93 mm., S.D. 1.49. These measurements indicated that there was a considerable difference between Groups I and II, but not much difference

between Groups II and III. Statistical analysis proved that the difference between Groups I and II was significant beyond the 1 per cent level of confidence, but that it was not significant between Groups II and III.

If one could accept the mean of such a small sample as representative, it would appear that there is a leveling off in bihamular width near the end of the second year of life in the normal child. The stabilization of the anteroposterior pharyngeal dimension at this age has been demonstrated longtudinally by others.[10, 11] It is likewise interesting to note the progressive decrease in the degree of variability with increased age, as indicated by the standard deviations. The standard deviation for Group I was 2.91, for Group II, 2.38, and for Group III, 1.49.

For future comparisons, the mean bihamular width was determined for the entire noncleft population under 3 years of age (fifty-one cases). The mean for this total grouping was found to be 24.61 mm., S.D. 2.77.

Type I (posterior clefts): This sample, consisting of twenty-nine subjects, was grouped according to age into the aforementioned age intervals. There were eleven subjects in Age Group I, eleven subjects in Age Group II, and seven subjects in Age Group III.

The bihamular width for Group I was 25.77 mm., S.D. 1.68; that for Group II, 30.36 mm., S.D. 2.79; and that for Group III, 31.64 mm., S.D. 2.30. The difference between the mean values for bihamular width measurements in posterior clefts and those derived for the comparable groups of noncleft palate population were significant beyond the 1 per cent level of confidence.

Again, in this group of clefts, the leveling off or stabilization of bihamular width was observed at approximately 2 years of age. A significant increase took place between Group I and Group II, but no statistically significant increase between Groups II and III was evident.

The bihamular width for the entire sample of posterior clefts was 28.93 mm., S.D. 3.39. A comparison of this value with that derived from the total normal sample (24.61 mm., S.D. 2.77) revealed a significantly larger nasopharyngeal width in the total sample of posterior clefts. This was statistically verified at the 1 per cent level of confidence.

Type II (unilateral clefts): This group numbered thirty-six, nineteen of whom were in Age Group I, seven in Age Group II, and ten in Age Group III. Analysis of the bihamular width within the unilateral cleft sample revealed that the mean widths were fairly uniform for all three age groups. A slight increase was noted with age increase. However, the differences between Age Group I and Age Group II, as well as between Age Group II and Age Group III, were not statistically significant. The consecutive mean bihamular widths were: 28.34 mm., S.D. 2.99; 29.71 mm., S.D. 2.55; and 30.90 mm., S.D 2.59. The difference between Age Group I and Age Group III was significant at the 5 per cent level of confidence.

The mean width in each unilateral cleft age group was significantly larger than that of the normal children within comparable age groups. However, the mean widths for each age group in the unilateral cleft sample were not

significantly larger than those of the posterior cleft groups except for Age Group I. In relating the mean bihamular width of all the unilateral clefts combined (29.31 mm., S.D. 2.95) to the gross normal mean (24.61 mm.), it became obvious that once again, as in the case of the combined posterior cleft groups (mean 28.93), a significantly greater nasopharyngeal width exists in posterior and unilateral clefts than is found in normal children.

This observed difference in bihamular measurements between these two cleft types and the normal children was statistically significant beyond the 1 per cent level of confidence. Conversely, it was determined that no statistically significant difference existed between the gross mean for Type I (posterior clefts) and for Type II (unilateral clefts).

Type III (bilateral clefts): Because of the limited number of subjects (thirteen) available in this cleft type, the sample was not divided into age groups. The mean bihamular width was calculated for the entire bilateral cleft population and was found to be 31.23 mm., S.D. 3.70.

This mean width closely approximated the gross mean established for Type II (29.31 mm., S.D. 2.95), as well as the gross mean established for Type I (28.93 mm., S.D. 3.39). Statistical analysis failed to indicate any significant differences among these three means. There seems to be a fairly close conformity in bihamular width in the gross cleft population, irrespective of type. However, this measurement appears to be consistently and statistically significantly greater than the mean width calculated for the normal children (24.61 mm., S.D. 2.77).

Type IV (alveolar clefts): Since this cleft type included only thirteen cases within the age range studied, age grouping again was not used.

The mean measurement derived for this cleft type presented a striking contrast to the means established for the other cleft types. Measurements revealed a mean bihamular width of only 25.98 mm., S.D. 2.32. Obviously, this mean value more closely approximated the mean value of the normal children (24.61 mm., S.D. 2.77) than it did the other cleft types (28.93 mm., 29.31 mm., and 31.23 mm.).

Statistically, it may be stated that no significant difference was evidenced between the mean width of the alveolar cleft and normal subjects. While corresponding closely to the normal, the mean bihamular width measurement in alveolar clefts was found to be significantly smaller than the other cleft means. It seemed to indicate than an aberration anteriorly is not necessarily associated with a similar aberration posteriorly.

2. *Birotundal Measurements.*—The greater widths found between the inferior tips of the medial pterygoid plates in cleft palate cases raised the question of whether there might be differences in widths at a higher level in the same bone. The foramen rotundum, located at the anterior and medial part of the great wing of the sphenoid, afforded bilateral points for a higher measurement. When the sphenoid bone is viewed in the frontal plane in laminagraphic section, these foramina are found superior to the lateral pterygoid plates and just lateral to the latero-inferior aspect of the body of the bone. The linear distance between their most lateral margins was measured.

No significant differences were found in this dimension among the individual types of cleft. It was decided, therefore, to throw the entire cleft population together and then divide it according to the three age groups. This made it possible to compare the values of the cleft population with those of comparable age groups in the normal population.

In the normal samples, the means of the birotundal width for the three successive age groups were found to be 29.16 mm., S.D. 3.70; 32.28 mm., S.D. 2.47; and 33.07 mm., S.D. 2.60. Once again there was found an increment in this dimension from the first to the second age group, which proved to be statistically significant beyond the 1 per cent level of confidence. However, as in the bihamular width dimension, there was no statistically significant increase between the second and third age groups.

The cleft palate sample included thirty-nine subjects in Age Group I, twenty-six subjects in Age Group II, and twenty-five subjects in Age Group III. The respective means for birotundal widths were 29.56 mm., S.D. 2.51; 33.62 mm., S.D. 2.19; and 34.84 mm., S.D. 2.82.

Comparison of the mean birotundal widths for each age group in the clefts with similar measurements in the corresponding normal age groups showed that no significant differences existed. In other words, the superior level of measurement in the cleft population for each age group showed no appreciable deviation from the normal measurements of analogous age groups.

The mean birotundal width for the entire normal sample was 31.41 mm., S.D. 3.39, and for the total cleft sample, 32.20 mm., S.D. 3.43. Thus, again no significant differences was evident between the cleft and normal subjects in this area of mensuration.

3. *Inclination of the Medial Pterygoid Plates.*—Since there was a significantly greater dimension in cleft palate cases at the most inferior point of measurement (bihamular width), but no significantly greater width at a higher level of measurement within the same bone (birotundal width), the possibility of a difference in the inclination of the pterygoid plates suggested itself. To examine this possibility the inclination of each right and left medial pterygoid plate was measured in relation to the horizontal cranial base line.

Right versus left inclination readings indicated that asymmetry existed within the normal subjects. However, the asymmetry noted in the clefts exceeded that found in the normal subjects. Moreover, the range in variability of inclination was greater in the cleft population.

In addition to right and left individual readings, the average degree of inclination was obtained to facilitate computations and interpretations, and the average inclination for each case was used as a single figure for that case. The customary age groupings of the various cleft type categories were utilized in making these angular measurements.

The mean angulation for the normal sample within each age group is as follows: 100.2 degrees in Age Group I, 97.83 degrees in Age Group II, and 96.93 degrees in Age Group III. The angulation of the pterygoid plates

within the normal population appeared to decrease progressively with increase in age. The mean inclination for each age group within each cleft type showed a similar decrease.

The mean angulation of the medial pterygoid plates for the total normal sample of fifty-one cases was 98.40 degrees, S.D. 3.65; for twenty-eight posterior clefts it was 106.98 degrees, S.D. 4.75; for thirty-six unilateral clefts it was 107.21 degrees, S.D. 5.89; for the thirteen bilateral clefts it was 107.94 degrees, S.D. 4.69; and for the alveolar clefts it was 102 degrees, S.D. 5.95.

The angulation of the plates in each type of cleft, with the exception of the alveolar clefts, was significantly greater (beyond the 1 per cent level of confidence) than that found in the normal population.

The mean angulation in alveolar clefts fell between the values established for other samples. It was significantly greater than the normal at the 5 per cent level but significantly smaller than any of the other cleft types. This finding may have been influenced by several submucous clefts within the alveolar cleft sample.

The "F" test, utilizing the various standard deviations, revealed only one area of possible incompatibility of variance in angulation measurements. The unilateral cleft cases showed greater variability in inclination than was observed in the variability of the normal cases. Whether this was the result of chance, of sampling, or of the high degree of variation within the unilateral clefts was impossible to say.

The greater bihamular width and greater angulation of the plates in cleft cases suggested that these two variables might be correlated.

To explore this possibility, the cleft palate sample, exclusive of the alveolar clefts, was divided into the three age groups. Because the alveolar clefts more nearly approached normal values, they were deleted and treated as a separate sample.

The coefficient of a correlation of angular and linear deviations in the cleft population was found to be 0.410 in Age Group I, 0.237 in Age Group II, and 0.621 in Age Group III. It may be stated, then, that a moderate correlation or a substantial relationship between degree of deviation in bihamular measurement and degree of deviation in angulation exists within the cleft group. According to accepted statistical standards, the correlations were not sufficiently high to consider them marked or very dependable relationships.

The alveolar cleft type, irrespective of age group, exhibited a low correlation.

4. *Bizygomatic Arch Measurement.*—That section of the zygomatic arch which is laminagraphically visible at the depth of the pterygoid plates was subjected to measurement. This area approximated the zygomaticotemporal suture. The linear distance between the most lateral margins of the right and left zygomatic arches was measured.

No significant differences between the different types of clefts were evident in this measurement. Therefore, it was decided to combine all cleft types and group the bizygomatic measurements into the three age categories previously utilized.

In analyzing the sample of normal cases, the following means for each successive age group were obtained: 81.33 mm., S.D. 7.83; 94.83 mm., S.D. 4.89; and 96.69 mm., S.D. 2.69. There was a statistically significant increase in this measure at the 1 per cent level of confidence between Age Group I and Age Group II. An increase in the mean linear dimension from Age Group II to Age Group III was also observed, but it could not be shown to be a statistically significant increase. As in the bihamular and birotundal measurements, there was an apparent leveling off of the curve at approximately 2 years of age.

At no age interval did the bizygomatic measurement in cleft palate cases differ significantly from that of the comparable normal age groups. In contrast to the normal, however, there was significant increase within the cleft population from Age Group II (93.88 mm., S.D. 4.41) to Age Group III (98.95 mm., S.D. 4.55). This was the first instance of a significant increase from Group II to Group III.

As in the normal, there was a large increase from Age Group I to Age Group II in clefts (79.89 mm., S.D. 6.87, to 93.88 mm., S.D. 4.41, respectively). The quantitative increase was comparable to the same age range within the normal groups; this indicates the same leveling off noticed in other measurements. This was not as striking within the cleft groups for the bizygomatic measurement because of the continued increment extended to Age Groups II and III.

The mean value for the entire normal sample was 86.82 mm., S.D. 8.99. Analysis of the entire cleft sample revealed a mean bizygomatic width of 89.22 mm., S.D. 10.10. No significant difference in bizygomatic dimension between the cleft and normal populations was evident when these gross means were subjected to the "T" test.

5. *Bimaxillary First Molar Measurement.*—In order to ascertain whether or not coexistent aberration existed in structures closer to the pterygoid plates, a point of measurement within the maxillary dental arch was sought. The tuberosity area of the maxillary arch seemed ideal for this measurement. The maxillary permanent molars within their crypts were clearly visible in the laminagram and were utilized.

Since all the cleft cases were unoperated, there was no possibility of shifts in position or changes in form resulting from the traumatic effects of surgery. The buccolingual center of the occlusal plane was marked to overcome vertical or horizontal differences in position of the tooth, and the distance between the two centers was measured.

The mean dimensions between the molar centers for the normal age groups were: Age Group I, 32.06 mm., S.D. 2.53; Age Group II, 36.89 mm., S.D. 2.56; and Age Group III, 37.93 mm., S.D. 3.58.

The means of the cleft measures, irrespective of type, were consistently greater than the means established for corresponding groups of normal measures. Specifically, the mean for Age Group I was 34.97 mm., S.D. 3.39; for Age Group II it was 39.73 mm., S.D. 3.11; and for Age Group III it was 40.64 mm., S.D. 3.65. The mean bimolar width for the entire cleft group was found to be 37.98 mm., S.D. 4.24.

Both when considered as a group and when broken down into age groups, there was a sufficiently greater dimension in cleft cases to exceed the 1 per cent level of confidence. In both the normal and cleft cases the greatest degree of increase was found when the first and second age groups were compared. There was also an insignificant increment between Age Group II and Age Group III in both normal and cleft cases.

In order to determine the degree of relationship between bihamular and bimaxillary molar measurements, correlations were made for the gross normal population and for each individual cleft type.

The positive correlation of 0.772 obtained in the normal population indicated that a marked relationship exists between these two width dimensions. The very fact that a high correlation exists between bihamular width and bimaxillary molar width indicates that the position of the molar is fairly stable in relation to the pterygoid plates.

A similarly high correlation between the bihamular width and the bimaxillary molar width was found to exist in each different cleft type. Too much reliance should not be placed on the correlation between the bihamular width and the bimaxillary molar width in the bilateral and alveolar clefts because of the small size of that sample.

The relative degree of correlation in all cleft cases, as well as in the normal cases, appeared uniform. All exhibited correlations above 0.7.

Lateral displacement of the maxillary tuberosities seems to be associated with a significantly larger nasopharyngeal width in the cleft cases. This is not surprising, since the pterygoid plates are locked to the maxillary tuberosities through the medium of the pyramidal processes of the palatine bones.

6. *Angular Measurement of the Vomer.*—The great variation in vomer and palatal shelf inclination observed in the cleft palate samples made it necessary to study the inclination of the vomer and the palatal shelves qualitatively rather than quantitatively.

In the normal population it was found that the vomer bone was most frequently a true perpendicular to the cranial base. Twenty-nine of the fifty-one normal children presented vomer bones in this perpendicular relationship. The range of deviation in the remaining twenty-two normal cases was from 1 degree to 7.5 degrees, with an average deviation of 3.8 degrees. The mean deviation from a perpendicular for the total normal population was 1.6 degrees.

Type IV (alveolar clefts) most closely approximated the normal with an average deviation of the vomer of 5.7 degrees from a perpendicular. Within this cleft type, several high angular deviations were found associated with a submucous cleft.

The greater proportion of the bilateral cleft sample exhibited a perpendicular vomer, with only four cases out of thirteen showing marked deviation. The mean deviation of the vomer for the total bilateral group was 7.5 degrees.

The vomer relationships in Type I (posterior clefts) found 38 per cent, or eleven of the twenty-nine cases, presenting a perpendicular vomer. The rest showed a considerable degree of deviation. The mean deviation for the group was 8.5 degrees, with a range from 0 to 26 degrees.

The greatest degree of deviation in vomer inclination was found in Type II (unilateral clefts). In the thirty-six cases studied, there was no instance of a perpendicular vomer. The vomer in this cleft type is attached to one side of the palate and was observed to deviate consistently toward the noncleft side of the palate. The range of deviation in unilateral clefts was from 4 to 58 degrees, with a mean deviation of 24.4 degrees.

7. *Inclination of the Horizontal Plates of the Palatine Bone.*—The inclination of the horizontal plates of the palatine bone was measured by a line representing the general plane of each horizontal plate. This line was extended until it intersected the base line drawn perpendicular to the cranial base line. The obtuse angle created by these two lines was measured. A subtraction of 90 degrees indicated the degree of deviation from the horizontal plane (Fig. 6).

The majority of the normal palatal shelves were observed to incline cranialward as they approached the midline. The average degree of inclination from the horizontal plane was 4 degrees, with a considerable number demonstrating almost horizontal relationships.

Considerable variation in palatal inclination was noticed in the cleft population, and it was not possible to establish any characteristic tendency for the sample. However, the alveolar clefts most closely approached the normal in this regard. The bilateral clefts, also, compared favorably with the normal subjects except in a few isolated cases. Greater variations were noted in the posterior and unilateral cleft types. A number of individual cases within these two cleft types showed a greater inclination cranialward than was observed in the normal population.

Of much more interest was the considerable number of cases in which the palatal plates were inclined toward the floor of the mouth, rather than cranially. Thirty-two per cent of the posterior and unilateral clefts and twenty-five subjects of the entire cleft population (ninety-one) showed this relationship. A slight degree of inverse inclination (less than 5 degrees) was also recorded within the normal sample. This condition is not restricted to the cleft population, but occurs much more frequently in the cleft palate cases. Also, whereas a 5-degree inverse inclination was found to be the limit in the normal, inclinations in the clefts, where there was an inverse inclination, ranged from 6 to 25 degrees, with a mean of 12.6 degrees.

In the cleft cases, there was a characteristic "clubbing" or thickening at the medial termination of the plates. This may be an indication of some growth potential expressing itself in this area, but occurring under a congenitally adverse situation.

DISCUSSION

This study seemed to indicate that the belief that an abnormally wide nasopharynx exists in cleft palate cases is well founded. The inferior tips of the medial pterygoid plates not only are wider apart linearly than in the normal, but their outward flare as they descend is greater.

In an effort to explain a developmental sequence which would assist in explaining the anatomic findings observed, a hypothesis may be offered, based upon embryologic development and muscular function. Embryologically, the nuclei for the medial pterygoid plates appear in the second month of fetal life and fuse with the nuclei of the great wings of the sphenoid in the fourth month.[12] Although the pterygoid plates fuse to the great wings prenatally, the fusion of the great wings with the body of the sphenoid bone consists of three parts: the body with the attached small wings, and two great wings, each of which has its corresponding pterygoid processes fused to it. Prior to the fusion, which takes place during the first year of postnatal life, an open suture exists between the body and great wings of the sphenoid.

Muscle structure is evident early in embryonic life. The tensor veli palatini muscle, for example, is distinguishable in the 14-mm. embryo, or at approximately 7 weeks of fetal life.[12] Muscle tissue is known to function prior to birth. Some investigators claim that muscular contraction occurs as early as the fetal age of 2 months.[13] It is possible that pre- and postnatal muscular activity influences the position and inclination of the pterygoid plates in the person with a cleft palate. The integrity of muscle function within the soft palate is lost when a cleft involving this area occurs. This is especially true of the paired tensor veli palatini muscles which take origin from (1) the scaphoid fossa at the base of the medial pterygoid plate, (2) the spina angularis of the sphenoid bone, and (3) the lateral cartilaginous wall of the auditory tube. Coursing downward, each terminates in a tendon which passes around the hamular process and proceeds medially to insert into the palatine aponeurosis and into the transverse ridge on the inferior surface of the horizontal portion of the palatine bones. In normal functioning, these muscles add rigidity to or tense the soft palate. Thus, the tensors veli palatini might conceivably act as stabilizers, creating a medialward direction of force which counteracts the effects of an outward pull by the pterygoid muscles on the pterygoid processes. The internal pterygoid muscles originate primarily from the pterygoid fossa with some fibers taking origin from the pyramidal process of the palatine bone and the maxillary tuberosity. In function they exert a downward and outward force. The external pterygoid muscles, originating on the outer surface of the lateral pterygoid plate and infratemporal surface of the great wing, course horizontally backward and lateralward. Functionally, they exert an outward force on the pterygoid processes.

With a lack of continuity of the tensor veli palatini muscles in cleft palate subjects, the restraining influence on the pterygoid plates is lost (Figs. 8, 9, and 10). This may explain the greater divergence between the hamular processes and the increased inclination of the medial pterygoid plates. The open suture, between the body and great wing of the sphenoid bone, might be a fulcrum area around which this muscular influence could express itself. The outward pull of the pterygoid muscles may create a widening of this suture prior to the fusion of the great wing and the body of the sphenoid.

Although the tongue, by creating lateral pressures, may augment this widening effect (Fig. 11), the buccinator musculature may be instrumental

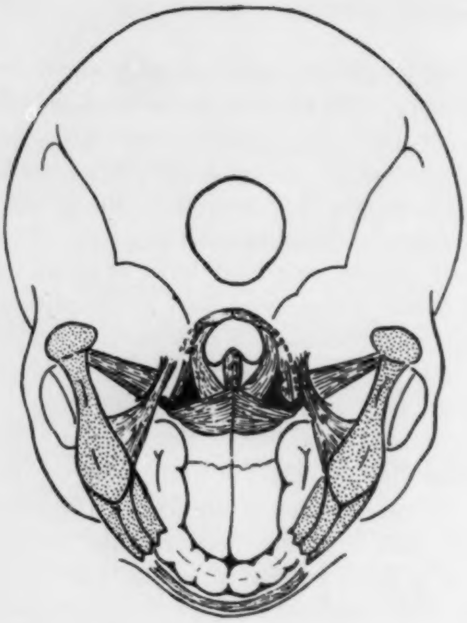

Fig. 8.

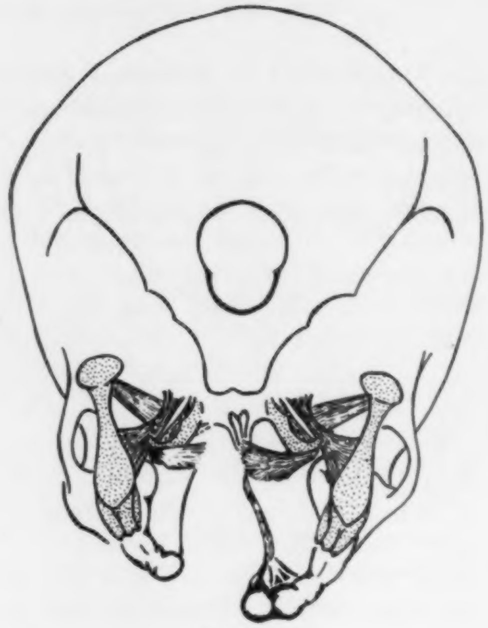

Fig. 9.

Fig. 8.—Drawing of the inferior view of a skull illustrating the harmonious balance of intact musculature. Completeness of the musculature of the soft palate restrains the outward pull of the pterygoid muscles.

Fig. 9.—Drawing of the inferior view of a skull to illustrate the loss of continuity of muscle structure as a result of a congenital cleft. There is decreased restraint on the outward pull of the pterygoid musculature.

Fig. 10.—Frontal view of the nasopharyngeal area illustrating: a loss of continuity of the tensor veli palatini muscles as a result of the cleft; the outward pull of the internal and external pterygoid muscles; the patent embryonic suture on both sides of the body of the sphenoid; the tongue, represented by the stippled area; the pterygomandibular raphes extending downward on both sides of the tongue.

in preventing an even greater divergence. The buccinator, running around the alveolar processes, is continuous posteriorly with the superior constrictor pharyngis through the medium of the pterygomandibular raphe. The two muscles, in this way, form a muscular ring attached posteriorly to the pharyngeal tubercle and to each medial pterygoid plate via the raphes. A re-establishment of the integrity of the lip musculature in cleft cases, therefore, should create some restraining influence on an excessive divergence of the bony nasopharynx.

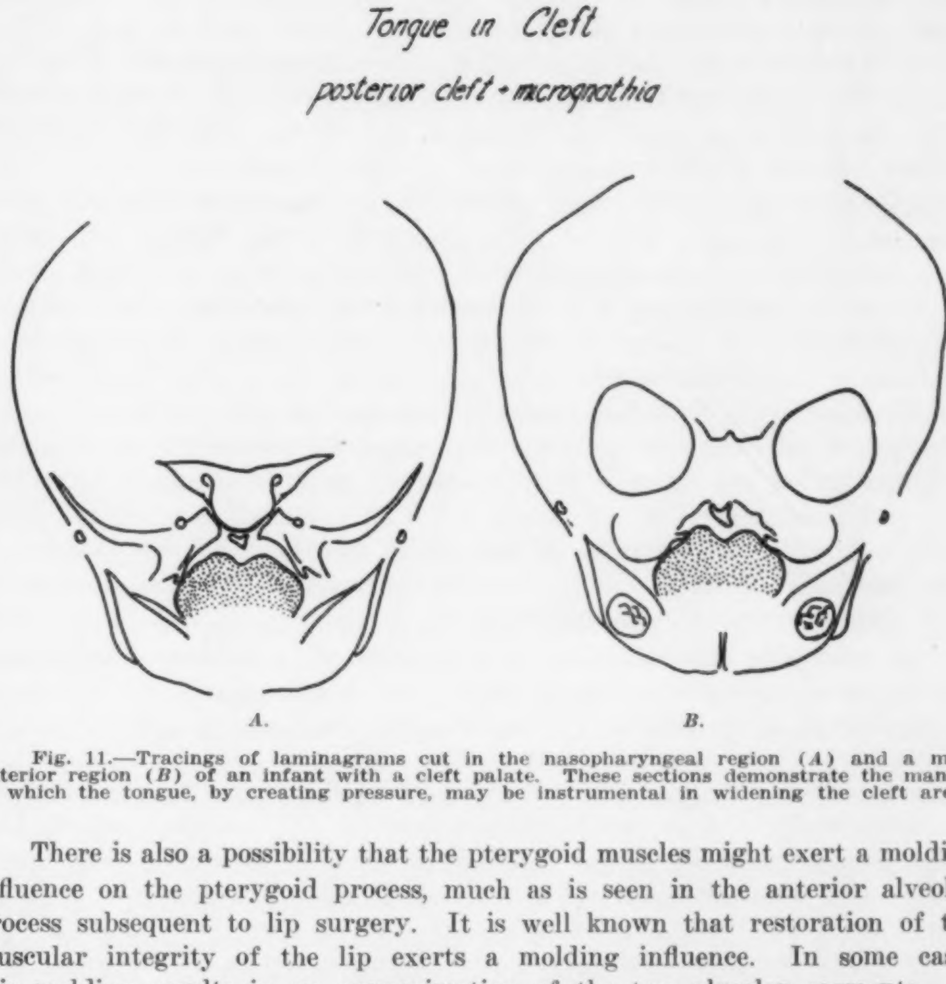

Fig. 11.—Tracings of laminagrams cut in the nasopharyngeal region (*A*) and a more anterior region (*B*) of an infant with a cleft palate. These sections demonstrate the manner in which the tongue, by creating pressure, may be instrumental in widening the cleft areas.

There is also a possibility that the pterygoid muscles might exert a molding influence on the pterygoid process, much as is seen in the anterior alveolar process subsequent to lip surgery. It is well known that restoration of the muscular integrity of the lip exerts a molding influence. In some cases this molding results in an approximation of the two alveolar segments. It has been suggested that the position of the alveolar segments prior to lip surgery is produced by the adverse and unequal influence of lip musculature and tongue pressures. The muscular influence of the pterygoid plates might be expressing itself by widening the suture, molding of the bone, or a combination of both. It is difficult to arrive at a definite conclusion.

Coexistent with the larger nasopharyngeal width in the cleft population, there was observed a corresponding increase in the width between the maxillary

tuberosities (expressed by the upper first molar measurements). This is understandable when the anatomic relationships of these structures are reexamined. The maxillary surface of the vertical part of the palatine bone articulates with the medial or nasal surface of the maxilla in the posterior region. Each pterygoid process, fused superiorly, divides below to create a fissure between the medial and lateral pterygoid plates.

The anterior border of the medial pterygoid plate articulates with the vertical portion of the palatine bone. The pyramidal process of the palatine bone fits into the fissure between the lower extremities of the medial and lateral pterygoid plates and articulates anteriorly with the tuberosity of the maxilla. Thus, there is a mechanical union between these three bones: sphenoid (pterygoid process), palatine, and maxilla. Any muscular influence exerted by the pterygoid musculature and tongue on one of these structures may well exert an influence on the others.

Only those structures which are intimately associated with the cleft aberration are noticeably affected. The zygomatic arches, formed principally by the temporal bones and distantly located in relation to the pterygoid plates, did not deviate appreciably in measurement when compared to normal subjects. This was true also of the foramina rotunda which represent sphenoid structures at a superior level.

To recapitulate, it is hypothetically possible that the wider and more laterally inclined pterygoid plates are the results of disproportionate muscular influences, which are active in the presence of an open suture between the body and great wings of the sphenoid. This explanation is offered with reservations since: (1) changes in the suture area have not been evaluated radiographically or histologically, and (2) it has not yet been possible to study these areas on a longitudinal basis.

An acceptable explanation for the existence of a downward inclination of the palatal plate demands embryologic and developmental interpretations. The primordia of the palate, growing from the maxillary process of the first branchial arch, are found to be projecting downward at both sides of the tongue very early in fetal life. The descent of the tongue in the primitive oro-narial cavity and an active proliferation of cells on the undersurface of the palatine processes permit the palatine processes to assume a horizontal position and subsequently to meet and fuse. This fusion occurs at approximately the tenth week of fetal life or earlier.[14] Any disturbance in this developmental sequence might permit the tongue to act as an obstruction and barrier during a critical period. A disproportionate proliferation on the undersurface of the palatine process also might prevent the palatal plate from achieving a horizontal position.

Within its present scope, this study was not intended to be a study of growth. Certain trends were consistently evident, however, and merit interpretation. All anatomic landmarks in the frontal plane (width dimensions) that were subjected to linear mensuration exhibited a characteristic "leveling off" in width, in all the populations studied, except for the bihamular width

in the unilateral cleft population in which there was a significant linear increment from Age Group I (under 1 year of age) to Age Group II (under 2 years of age). A nonsignificant linear increment in width from Age Group II to Age Group III was noted in all areas of measurement except for the bizygomatic width in the cleft population.

These findings tend to substantiate the findings of Hellman,[15, 16] who noted a stabilization of the postnarial dimension at an early age and postulated that the major portion of growth in width is achieved by 2 years of age.

CONCLUSIONS

1. Linear measurements of the skeletal nasopharynx indicated that the width dimension in cleft palate cases was significantly larger than in the normal children.

2. Inclination measurements of the medial pterygoid plates in relation to the cranial base indicated that the inclination in cleft cases was significantly greater than in the normal cases.

3. Only those anatomic structures intimately associated with the cleft aberration were noticeably affected.

4. Bimaxillary measurement revealed that the means of the cleft subjects, irrespective of types, were always greater than those in the normal subjects. A uniformly high correlation between bihamular and bimaxillary first permanent molar measurements was observed. It is reasoned that, with the larger nasopharyngeal width, there is an increase in width between the maxillary tuberosities.

5. In a significant number of the cleft cases, there was a downward and not a cranialward inclination of the horizontal part of the palatine bones.

6. All measurements in the width dimension in cleft and normal samples show a characteristic leveling off at approximately the second year of age.

7. Individual cases showed wide ranges of variation; some closely approaching the range of normal children and others showing marked deviation. Therefore, it is evident that diagnosis must be carried out on a highly individualistic basis. Only central tendencies were expressed within the scope of this study.

More research is imperative before these findings can be meaningfully interpreted with other objective and subjective diagnostic observations. Correlations of frontal and lateral (anteroposterior) dimensional evaluations must be established. There is a need for growth and therapeutic studies on a longitudinal basis. On an individualistic basis, critical questions concerning adequacy and/or displacement of osseous and soft tissue must be resolved.

SUMMARY

Laminagraphy, a body-sectioning radiographic technique, was utilized in this study to evaluate objectively the lateral dimensions of the osseous nasopharyngeal and related areas. One hundred forty-two children under 3 years of age were examined radiographically. The sample included ninety-one un-

operated cleft cases and fifty-one noncleft palate cases. Both cleft palate and normal subjects were grouped with respect to age: Age Group I (0 to 1 year of age), Age Group II (1 to 2 years of age), and Age Group III (2 to 3 years of age). The cleft population was grouped according to four types of cleft: Type I, posterior clefts; Type II, unilateral clefts; Type III, bilateral clefts; and Type IV, alveolar clefts.

Bihamular measurements appear to indicate that a tendency toward a leveling off in nasopharyngeal width occurs during the second year of life. All cleft types (with the exception of Type IV, alveolar) show wider nasopharyngeal dimensions than were observed in normal subjects. Statistically, the significance of these mean differences exceeded the 1 per cent level of confidence. Cleft Types I, II, and III were remarkably uniform in mean bihamular measurement, irrespective of type.

A leveling off in birotundal width similar to that noted in bihamular measurements, was observed in the normal children and in the cleft palate cases during the second year of life. When all cleft types and age groups were combined and compared with the total normal population, no significant difference in birotundal measurements was evident. This finding was in striking contrast to the marked differences observed in biohamular measurements.

Analysis of the angular inclination of the pterygoid plates revealed that asymmetry regarding right and left inclination of the pterygoid plates was noted in normal and cleft cases; a greater asymmetry was evident in cleft cases. Normal and cleft mean angulation for specific age groups indicated a progressive decrease in inclination with increment in age. The angulation of the medial pterygoid plates was greater in all cleft types.

In an effort to determine whether aberrations appeared in other bones, measurements of the zygomatic arch and the first permanent maxillary molars were made. A leveling off process for both measurements was noticed at about 2 years of age in cleft palate victims and normal children. No difference in bizygomatic measurements was demonstrated between individual types of clefts or between cleft palate and normal subjects. The abnormal width in cleft cases that was obvious in bihamular measurement was not revealed in the bizygomatic measures. The means of the bimaxillary measurements of the cleft subjects, irrespective of types, were always greater than those in the normal subjects. A uniformly high statistical correlation between bihamular and bimaxillary measurements was obtained.

Normal subjects most frequently presented a vomer that was perpendicular to the cranial base, and with little variation. The vomer inclination of the cleft subjects, differing noticeably from the normal, tended to differentiate clefts into types. Unilateral clefts showed the greatest degree of deviation from the perpendicular. A slight degree of variation in inclination of the palatal plates was observed in the normal population. In contrast, the cleft samples demonstrated great variability and a more frequent occurrence of inverse relationship or inclination of the palatal plates toward the floor of the mouth.

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THE SIGNIFICANCE OF GENETIC AND NON-GENETIC FACTORS IN THE PROFILE OF THE FACIAL SKELETON

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RECORDED differences between identical twins may be due to measurement errors. These are determined by double observations on the same person and are assumed in the following to be eliminated by the appropriate statistical methods. The differences also may be due to non-genetic etiological factors. The latter can be true environmental factors, such as nutrition, habits, or extractions, or they can be caused by internal environmental factors. In the wonderful process of growth from the fertilized egg to the adult man or woman, with the enormous number of cell divisions involved, it is unlikely that the result could be exactly the same for two persons with the same heredity, even if the external environments were identical. There must be a certain scope for random deviations from the average of that gene composition working in a given external environment, caused by variations in the internal environment. This random variation probably is also responsible for most of the minor differences between right and left sides.

In fraternal twin pairs the same differentiating factors are active as in identical pairs; in addition, there are the genetic factors. The composition of the variance in fraternal twins (σ_{II}^2) may be expressed, therefore, in the following way:

$$\sigma_{II}^2 = \sigma_I^2 + \sigma_{gen}^2$$

where σ_I^2 = the variance of identical twins = the variance due to nongenetic factors and σ_{gen}^2 = the variance due to genetic factors. As the variance for fraternal and identical twin pairs can be calculated from the differences within the two types of twin pairs,† it is easy to determine the variance due to genetic factors.

Twin investigations give an expression of the conditions within families. Nonrelated population pairs differ more than fraternal twins, as both genetic and environmental conditions differ more between unrelated persons than within families. To what extent may results from twin investigations be applied on conditions to the whole population? As the difference in variability

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†Using the formula $\sigma^2 = \frac{\Sigma d^2}{2N}$, where d is the difference between the twins and N the number of pairs investigated.

between population pairs and twin pairs is not very large, and as both heredity and environment contribute to this difference, it seems probable that the deviation between population and twins in the ratio between genetic and nongenetic influences is without any great importance.[1, 4, 5]

In order to determine the influence of genetic and nongenetic factors in the facial skeleton, a study was made of the profile x-ray films of 100 pairs of twins, 50 identical and 50 fraternal, the members of each pair being of the same sex. The majority of the twins were between 12 and 15 years of age.

The diagnosis for identical and fraternal twins was based on the degree of exterior similarity (apart from variations in the position of the jaws and teeth). The color and color distribution of the iris of the eye and the shape of the ears and the hands were used as supplementary aids. For fourteen pairs, blood grouping was performed (A-B-O, M-N, Rh, C-D-E, S, and P factors) and in none of these pairs did this analysis contradict the results obtained by the similarity comparison.

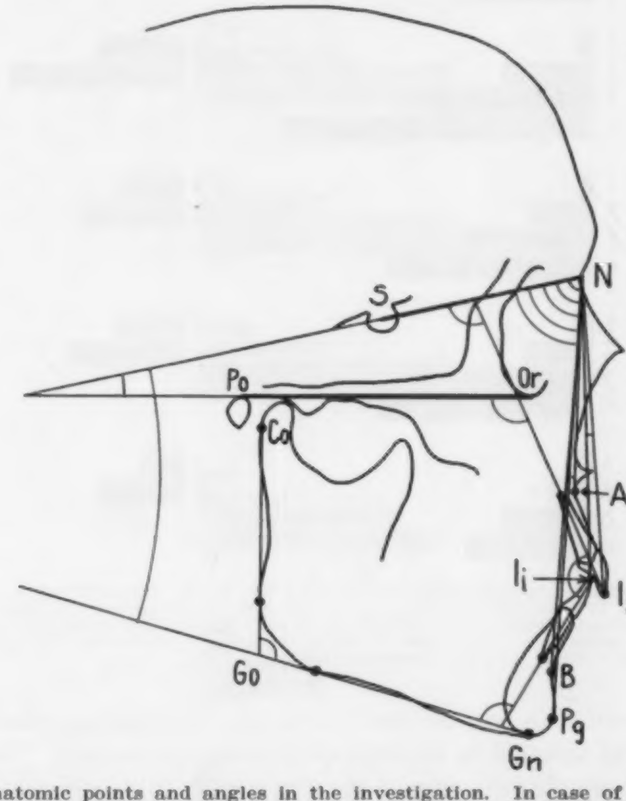

Fig. 1.—Anatomic points and angles in the investigation. In case of double contours of orbitale (*Or*) the posterior lower contour was used, for points determining the jaw angle (*Gn-Go-Co*) the means between left and right sides were used.

The distances and angles studied and the results of the division of the variability into genetic and nongenetic standard deviations are given in Figs. 1, 2, 3, and 4. The calculations indicate that genetic factors have a greater influence than nongenetic factors for most of the characteristics studied.

Special interest attaches to the sagittal overbite and the sagittal apical base relationship.

The results indicate that the nongenetic variability (errors of measurements eliminated) is about equal for these two properties (0.69 degrees and 0.85 degrees), while the genetic dispersion seems to be smaller for the overjet (0.90 degrees) than for the apical base relation (1.81 degrees). This is in accordance with the demands of biology, as the maintenance of correct overbite must be of greater functional importance than a specified value of the subspinale-nasion-supramentale angle.

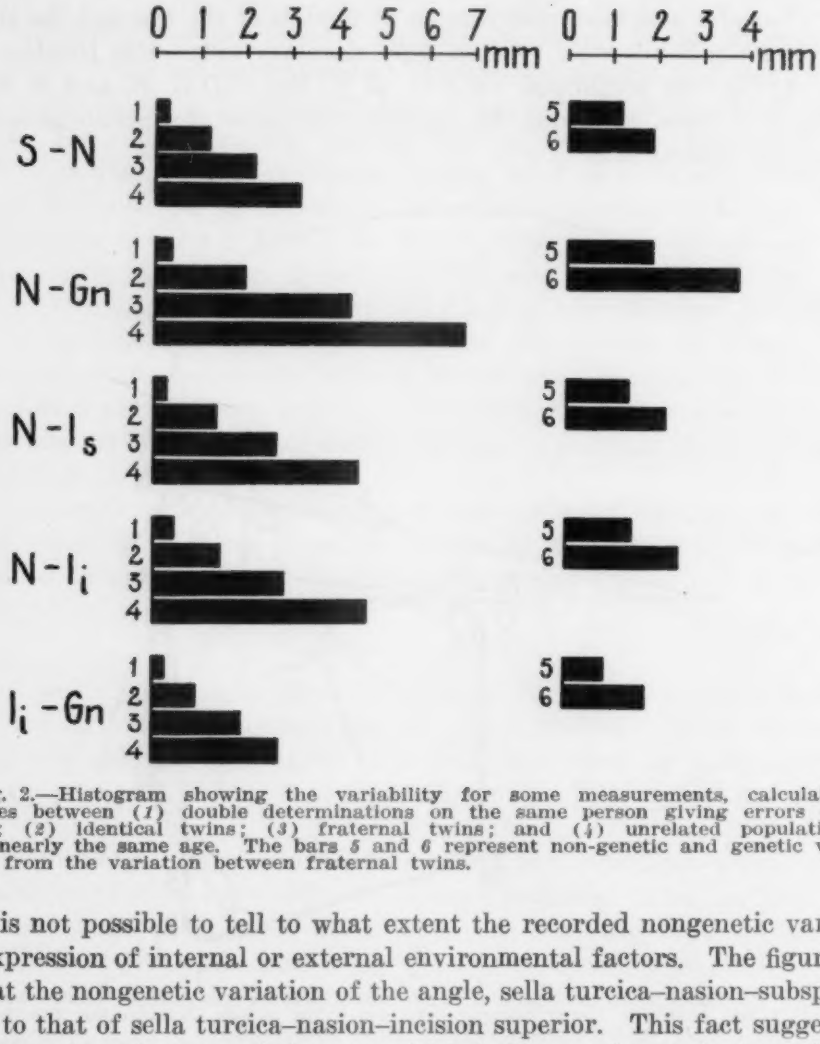

Fig. 2.—Histogram showing the variability for some measurements, calculated from differences between (*1*) double determinations on the same person giving errors of measurement; (*2*) identical twins; (*3*) fraternal twins; and (*4*) unrelated population pairs of very nearly the same age. The bars *5* and *6* represent non-genetic and genetic variations resolved from the variation between fraternal twins.

It is not possible to tell to what extent the recorded nongenetic variability is an expression of internal or external environmental factors. The figures indicate that the nongenetic variation of the angle, sella turcica–nasion–subspinale is similar to that of sella turcica–nasion–incision superior. This fact suggests that such external environmental factors, which influence the teeth through direct pressure, might be of minor importance in the total variability observed in a nonselected group. If such pressures were of any considerable significance, one would expect a larger variability for the incisal edges than for the subspinal (A point).

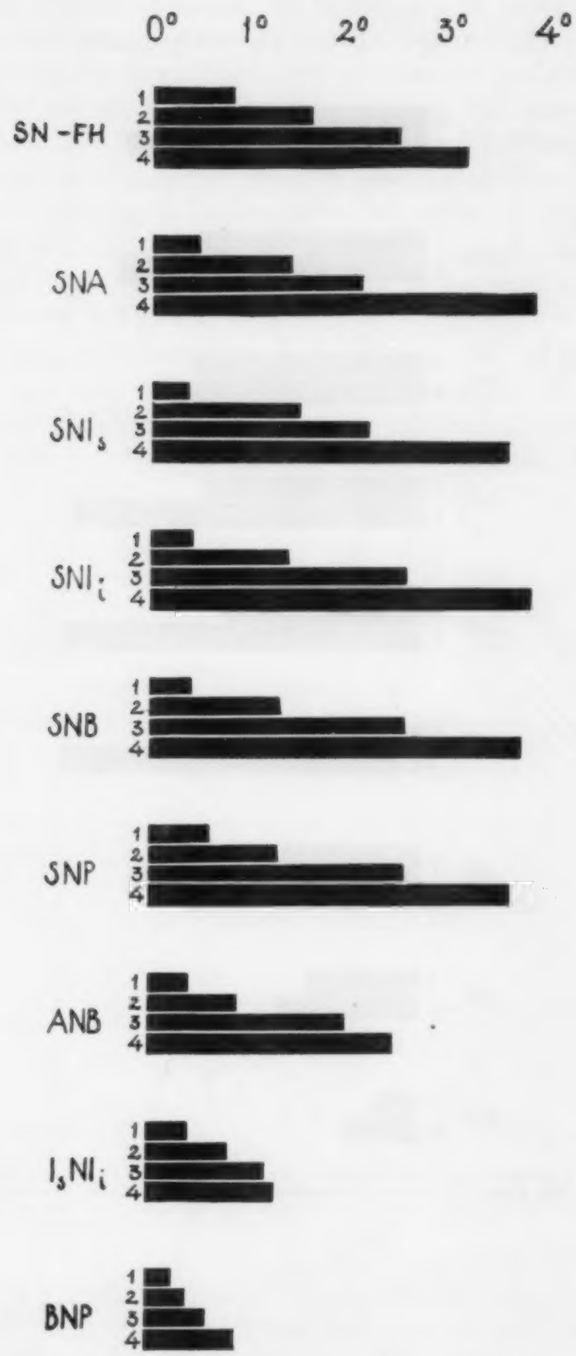

Fig. 3.—Histogram showing the variability for some angles, calculated from differences between (*1*) double determinations on the same person giving errors of measurement; (*2*) identical twins; (*3*) fraternal twins; and (*4*) unrelated population pairs of very nearly the same age.

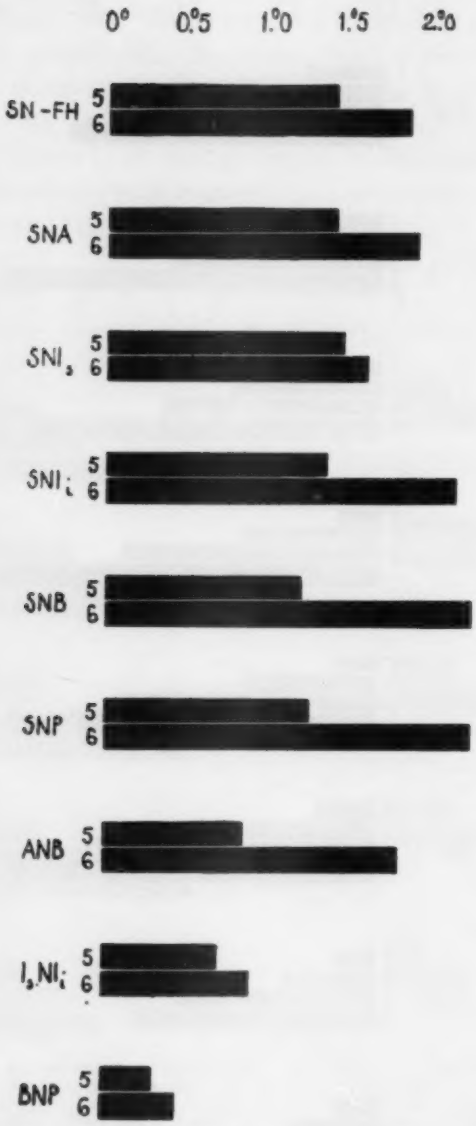

Fig. 4.—Histogram representing non-genetic (5) and genetic (6) variations for some angles, resolved from the variation between fraternal twins.

TABLE I

HABIT	OVERJET (MM.)		OVERBITE (MM.)	
	A	B	A	B
Finger-sucking	3.0	5.5	0	0.2
No finger-sucking	3.0	2.5	1.5	0.2

In order to study the effect of one of these factors—finger-sucking—the data given in Fig. 5 were collected. It is shown that in 40 to 50 per cent of the pairs at least one of the twins was declared to be a finger-sucker at some period. Similarity in the occurrence and duration of the habit was considerably more frequent for the identical twins than for the fraternal twins, a fact which suggests that the disposition to the habit is, to some degree, hereditary.

From the etiological point of view, particular interest attaches to such identical pairs for which large dissimilarities in the habit were obtained. The overjet and overbite at 9 and 15 years in pairs A and B, where one twin did not have the habit and the other twin had it to the ages of 8 and 6 years, respectively, are shown in Table I.

In corresponding fraternal pairs, no consistent effect of the habit could be detected. In the case with the greatest difference in overjet the relationship was contrary to the expected, the finger-sucker (to 10 years) presenting an overjet of 3.5 mm., while the non-sucker had an overjet of 9.5 mm. A probable explanation is that there was here a hereditary influence of stronger effect than the finger-sucking.

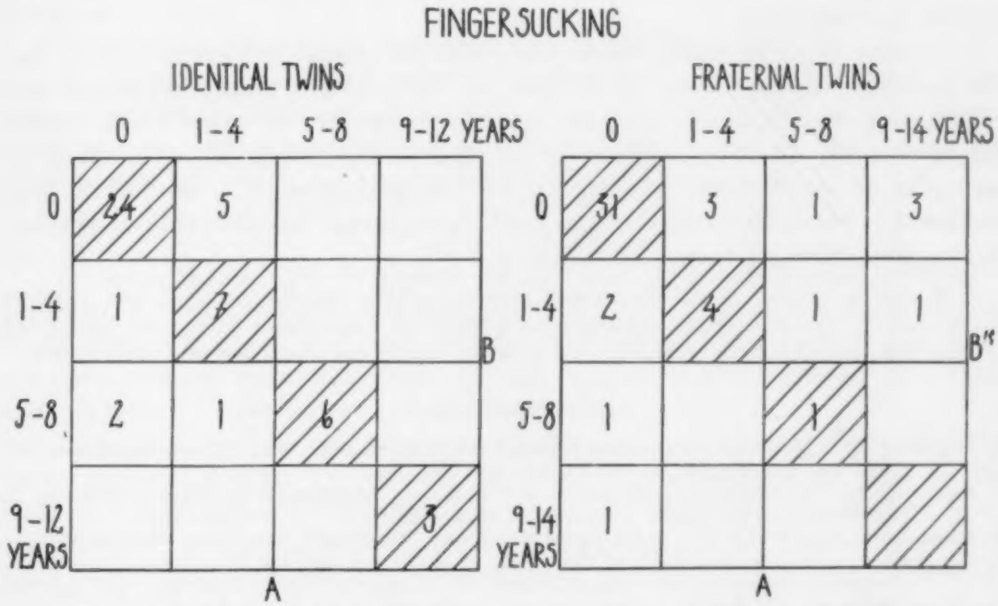

Fig. 5.—Distribution of finger-sucking in identical and fraternal twin pairs. The first-born twin (*A*) is plotted on the abscissa and the second-born (*B*) on the ordinate. Ages given show the age when the finger-sucking stopped.

The overjet and overbite in some pairs, where both twins were finger-suckers as long as to ages 8-9, 11 and 10-12 years, were not extremely high at the ages of 15, 13 and 15 years. The overjets were: 4.0-4.5, 4.3-3.0, and 2.0-2.0 mm. and the overbites, 4.7-3.2, 4.2-3.0, and 1.5-0.9 mm.

The material is small and does not warrant any general conclusions. It indicates, however, that finger-sucking was not an important factor in the variations of overjet and overbite in the study group.

From a therapeutic aspect, the results would seem to indicate the possibility for us to change the sagittal apical base relationship. When common nongenetic factors can modify this relationship, we ought to be able also to improve disturbing deviations with our comparatively powerful therapeutic measures. It must be remembered, however, that we do not know at what stages of development the nongenetic influence is exerted. It is quite possible that most of the nongenetic modifications develop before birth, as the internal environmental factors presumably are most active in embryonic life. It is by no means self-evident that this early part of the individualization can be copied at a later stage.

From the theoretical aspect, it is probable that patients who are "genetically better" than their status at the beginning of the treatment have a better prognosis than patients of the opposite type, in whom Nature already has used the available margin of modification, and our treatments, therefore, involve an attempt to increase the difference between genotype and phenotype. These considerations are of little practical significance as long as we cannot determine the individual genotype, but perhaps they may serve to explain, in part, the different responses to treatment displayed by patients having morphologically similar deviations in sagittal jaw relations.

In some types of malocclusion there may be special reasons to believe that the genotype is better than the phenotype—for example, where the apical base relationship is satisfactory and the excessive maxillary or mandibular overjet depends upon incorrect inclination of the teeth, combined with abnormal muscular or other force. Another condition indicative of a nongenetic malocclusion is obtained when the rest position is normal but the occlusal position is abnormal through cuspal interference.

I wish to express to all officers and members of the societies, where I was given an opportunity to read the three foregoing papers, my warm appreciation of the fine time I had in their company and of the attention and generous hospitality that I received everywhere.

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SOME FACTS CONCERNING THE OPEN COIL SPRING

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INTRODUCTION

DESPITE the extensive literature concerning the use of coil springs in orthodontics, there appear to be only scattered data concerning the relationship between coil length, diameter of lumen, size of core, amount of compression, and pressure developed. It is a major purpose of this article, therefore, to provide a systematic compilation of data relating to these variables. It is hoped that these data will be of practical value in enabling the orthodontist to select quickly and accurately a proper coil spring and core to meet the requirements of a particular case, as imposed by space available for the coil and by pressure required.

The data indicate that elongated coil springs are ideal for obtaining a gentle continuous corrective force. A technique is described for forming a new type of coil spring and for adjusting it in a quick and simple manner during treatment to compensate for decreases in pressure caused by fatigue of the spring material.

REVIEW OF THE LITERATURE

In going through the literature, we find that there is a marked absence of information about the open coil spring. One of the earliest references to anything similar to a coil was made by Byrnes,[4] who soldered pleated gold band material between two attachments so that spaces could be opened or expansion obtained by opening or closing the pleats.

In later literature, the Arnold coil spring became very popular. In 1931, an article was written by Arnold,[1] in which a description was given of the method of using the coil compressed against the buccal attachment and arch wire.

In 1934, Arnold[2] published an article in which he advocated the use of coils on a lingual arch wire for expansion and observed that coils 0.010 inch in diameter, made of precious metal, with an 0.040 inch lumen, were equivalent to an 0.007 inch or 0.008 inch wire of steel.

In an article published in the same year, Johnson[5] stated that he used 4 ounces of pressure on a molar coil spring (0.009 inch on 0.030 inch lumen) by compressing the spring 1/32 inch, against 5 or 6 ounces of elastic pressure from the use of intermaxillary elastics.

In 1939, Paulich[11] wrote an article describing measurements of elastic force and finger spring force, but did not measure coil springs.

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

In 1941, Rose[12] did some excellent research in regard to tensile strength, elongation, and general properties of orthodontic materials.

In 1941, Johnson[6] published an article that was the basis of the use of our coil springs of today. He explained some of the factors concerning coil springs in regard to the force applied. Dr. Johnson gave us five very fine points to be considered in regard to the open coil spring. They are, briefly, as follows:

1. Precious metal springs are only about one-half as efficient as steel made from 8-18 steel alloy.
2. The smaller the diameter of spring wire used, the weaker it is, if wrapped on the same lumen or core.
3. The same diameter spring wire is stronger on a smaller gauge arch wire than on a larger gauge arch wire.
4. The longer the spring, the weaker the force, if compressed the same amount.
5. A spring that fits a wire too snugly will bind and loose some of its efficiency in friction.

In 1942, Oppenheim[8] said: "Since we are quite in the dark as to whether an individual has a high tissue resistance or is very susceptible to damage, I consider it unjustified and wrong to use indiscriminately the same measured amounts of force for all persons, even disregarding their ages. I repeat again: We have only one reliable criterion for the correctness of the forces applied in any given individual, i.e., the firmness and sensitivity of the teeth."

In 1944, Oppenheim[9] did some work on mature monkeys (*Macaca rhesus*), involving three experiments, in two of which coil springs were used. For each, a plain arch of precious metal, 0.030 inch thick, was inserted into buccal tubes soldered to caps on the molars and premolars and tied to the banded incisors with steel ligatures. Coil springs furnished the continuous force in the first and third experiments. The coil springs of stainless steel wire were 0.010 inch in diameter and 1 cm. long, with the individual coils separated from each other by a distance of 1 mm. They were compressed between the mesial ends of the tubes and spurs on the arches to different lengths—in one experiment, to one-half their original length and, in the other, to two-thirds their original length. The force necessary for such a compression was 180 grams in the first case and 120 grams in the latter case. However, as two springs were used, one on each side, the pressures exerted on the teeth amounted to 360 grams and 240 grams, respectively. It must not be forgotten that every spring gradually becomes fatigued, depending on the material as well as the duration of the compression. For instance, when the above coil spring, 1 cm. long, was loaded for five days with 120 grams, it returned to a length of 8 mm. when the pressure was released. Thus, the pressure delivered actually can only be estimated. In the treatment of patients, such measuring is useless, as the reactions to the same force are different in different persons. The only criteria we have as to the appropriateness of the force are the firmness and lack of soreness of the teeth.

Therefore, in order to judge within general limits the relationships between the amount of force and the changes brought about by this force, we have to measure it.

Up to this time, the only articles written that had given definite findings on the amount of force, in either grams or ounces, were by Johnson and Oppenheim. Both gave us information as to the length of spring and amount of compression.

In 1947, Nagamoto[7] wrote an article in which he explained how to make the single and double contraction coil spring. This is a pull type spring or closed coil, just the opposite of the open coil, but for all practical purposes, the results are identical, and it is a very fine spring.

In 1951, Bell[3] wrote a splendid article on coil springs and elastic pressure. He summarized his findings with this statement: "If the greatest amount of force is desired, the largest size wire wound on the smallest arbor practical should be selected, being cautious to avoid friction loss." Bell compressed his coils one-half their length before testing to make them consistent. He used 20-, 30-, and 40-millimeter length springs and found displacement on the 40-millimeter length to be more responsive to a given amount of force but, as the length of spring was shortened, the force per millimeter was increased, although the displacement was less.

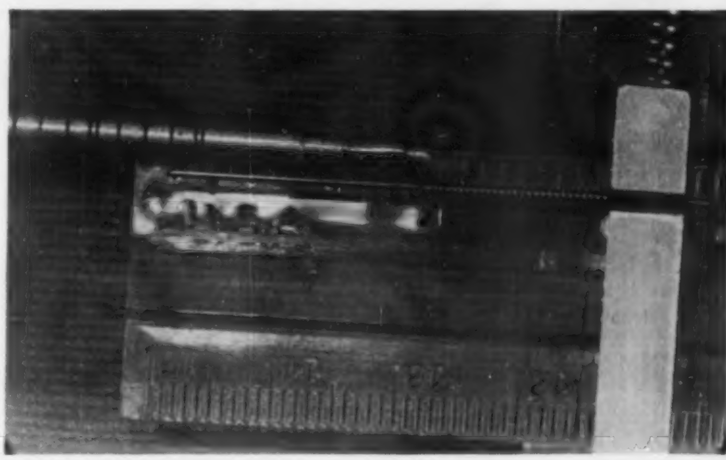

Fig. 1.—Richmond spring gauge and spring placed on Unitek winder for measuring.

It is the purpose of this article to aid the orthodontist who is using coil springs, by showing the ideal coil to use on most gauges of wire as regards length of coil and gauge of spring wire used.

The experiments that were done and their resulting information were accomplished by the use of a Richmond spring gauge or Dentrix which was tested for accuracy by the Research Department of the Phillips Petroleum Company. Each gauge of arch wire was placed on a Unitek spring winder with a ruler taped to the winder. Springs were then placed on the arch wire and tested with the gauge by pushing against the springs with the fork of the Dentrix (Fig. 1).

TABLE I

SPRING SIZE (INCHES)	ARCH DIAMETER (INCHES)	LENGTH COM-PRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH COM-PRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH OF SPRING (INCHES)
0.006 × 0.020	0.018	1/8	2	1/4	4	1
0.006 × 0.020	0.018	1/8	4	1/4	8	1/2
0.006 × 0.020	0.018	1/16	4	1/8	8	1/4
0.006 × 0.020	0.022	1/8	2	1/4	4	1
0.006 × 0.020	0.022	1/8	4	1/4	8	1/2
0.006 × 0.020	0.022	1/16	4	1/8	8	1/4
0.006 × 0.022	0.018	1/8	1 1/2	1/4	3	1
0.006 × 0.022	0.018	1/8	3	1/4	6	1/2
0.006 × 0.022	0.018	1/16	3	1/8	6	1/4
0.006 × 0.022	0.022	1/8	1 1/2	1/4	3	1
0.006 × 0.022	0.022	1/8	3	1/4	6	1/2
0.006 × 0.022	0.022	1/16	3	1/8	6	1/4
0.007 × 0.022	0.018	1/8	2	1/4	4	1
0.007 × 0.022	0.018	1/8	4	1/4	8	1/2
0.007 × 0.022	0.018	1/16	4	1/8	8	1/4
0.007 × 0.022	0.022	1/8	2	1/4	4	1
0.007 × 0.022	0.022	1/8	4	1/4	8	1/2
0.007 × 0.022	0.022	1/16	4	1/8	8	1/4
0.008 × 0.022	0.018	1/8	4	1/4	8	1
0.008 × 0.022	0.018	1/8	8	1/4	14	1/2
0.008 × 0.022	0.018	1/16	8	1/8	16	1/4
0.008 × 0.022	0.022	1/8	4	1/4	8	1
0.008 × 0.022	0.022	1/8	8	1/4	14	1/2
0.008 × 0.022	0.022	1/16	8	1/8	16	1/4
0.008 × 0.030	0.018	1/8	1 1/2	1/4	3 1/2	1
0.008 × 0.030	0.018	1/8	3	1/4	7 1/2	1/2
0.008 × 0.030	0.018	1/16	4	1/8	8	1/4
0.008 × 0.030	0.030	1/8	2 1/2	1/4	4	1
0.008 × 0.030	0.030	1/8	4	1/4	8	1/2
0.008 × 0.030	0.030	1/16	4	1/8	8	1/4
0.008 × 0.032	0.018	1/8	2	1/4	4	1
0.008 × 0.032	0.018	1/8	4	1/4	7	1/2
0.008 × 0.032	0.018	1/16	4	1/8	7	1/4
0.008 × 0.032	0.032	1/8	2 1/2	1/4	4 1/2	1
0.008 × 0.032	0.032	1/8	3 1/2	1/4	8	1/2
0.008 × 0.032	0.032	1/16	4	1/8	8	1/4
0.008 × 0.036	0.018	1/8	3/4	1/4	3	1
0.008 × 0.036	0.018	1/8	3	1/4	7	1/2
0.008 × 0.036	0.018	1/16	1 1/2	1/8	5	1/4
0.008 × 0.036	0.036	1/8	1	1/4	3	1
0.008 × 0.036	0.036	1/8	3	1/4	5 1/2	1/2
0.008 × 0.036	0.036	1/16	3	1/8	5 1/2	1/4
0.009 × 0.020	0.018	1/8	5 1/2	1/4	13	1
0.009 × 0.020	0.018	1/8	12	1/4	20	1/2
0.009 × 0.020	0.018	1/16	10	1/8	18	1/4
0.009 × 0.020	0.020	1/8	7	1/4	14	1
0.009 × 0.020	0.020	1/8	12	1/4	22	1/2
0.009 × 0.020	0.020	1/16	12	1/8	22	1/4
0.009 × 0.030	0.018	1/8	3	1/4	6 1/2	1
0.009 × 0.030	0.018	1/8	6	1/4	13	1/2
0.009 × 0.030	0.018	1/16	6	1/8	12	1/4
0.009 × 0.030	0.030	1/8	4	1/4	8	1
0.009 × 0.030	0.030	1/8	8	1/4	16	1/2
0.009 × 0.030	0.030	1/16	8	1/8	16	1/4
0.009 × 0.032	0.018	1/8	3	1/4	4	1
0.009 × 0.032	0.018	1/8	6	1/4	10	1/2
0.009 × 0.032	0.018	1/16	6	1/8	10	1/4
0.009 × 0.032	0.032	1/8	3	1/4	6	1
0.009 × 0.032	0.032	1/8	6	1/4	12	1/2
0.009 × 0.032	0.032	1/16	6	1/8	12	1/4
0.009 × 0.036	0.018	1/8	2	1/4	4	1

TABLE I—CONT'D

SPRING SIZE (INCHES)	ARCH DIAMETER (INCHES)	LENGTH COMPRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH COMPRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH OF SPRING (INCHES)
0.009 × 0.036	0.018	⅛	4½	¼	9	½
0.009 × 0.036	0.018	1/16	7	⅛	10	¼
0.009 × 0.036	0.036	⅛	3	¼	6	1
0.009 × 0.036	0.036	⅛	6	¼	12	½
0.009 × 0.036	0.036	1/16	6	⅛	12	¼
0.010 × 0.030	0.018	⅛	5	¼	10	1
0.010 × 0.030	0.018	⅛	9	¼	17	½
0.010 × 0.030	0.018	1/16	8	⅛	16	¼
0.010 × 0.030	0.030	⅛	6	¼	12	1
0.010 × 0.030	0.030	⅛	12	¼	24	½
0.010 × 0.030	0.030	1/16	12	⅛	24	¼
0.010 × 0.032	0.018	⅛	4	¼	8	1
0.010 × 0.032	0.018	⅛	8	¼	16	½
0.010 × 0.032	0.018	1/16	8	⅛	16	¼
0.010 × 0.032	0.032	⅛	4	¼	8	1
0.010 × 0.032	0.032	⅛	8	¼	16	½
0.010 × 0.032	0.032	1/16	8	⅛	16	¼
0.010 × 0.036	0.018	⅛	3	¼	5	1
0.010 × 0.036	0.018	⅛	6	¼	14	½
0.010 × 0.036	0.018	1/16	6	⅛	13	¼
0.010 × 0.036	0.036	⅛	4	¼	8	1
0.010 × 0.036	0.036	⅛	8	¼	16	½
0.010 × 0.036	0.036	1/16	8	⅛	16	¼
0.010 × 0.040	0.018	⅛	3	¼	6	1
0.010 × 0.040	0.018	⅛	5	¼	10	½
0.010 × 0.040	0.018	1/16	5	⅛	10	¼
0.010 × 0.040	0.040	⅛	3	¼	6	1
0.010 × 0.040	0.040	⅛	6	¼	12	½
0.010 × 0.040	0.040	1/16	6	⅛	12	¼

TABLE II

SPRING SIZE (INCHES)	ARCH DIAMETER (INCHES)	LENGTH COMPRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH COMPRESSED (INCHES)	OUNCES OF PRESSURE	LENGTH OF SPRING (INCHES)
0.008 × 0.030	0.030	⅛	2	¼	4	1
0.008 × 0.030	0.030	⅛	4	¼	8	½
0.008 × 0.030	0.030	1/16	4	⅛	8	¼
0.010 × 0.030	0.030	⅛	4	¼	8	1
0.010 × 0.030	0.030	⅛	8	¼	16	½
0.010 × 0.030	0.030	1/16	8	⅛	16	¼

In studying Tables I and II, one will note that in all instances the spring, 1 inch long when compressed, will exert approximately one-half as much pressure as a spring ½ inch long when each is compressed ¼ or ⅛ inch. One notes also that for the same gauge of spring wire, such as the 0.008 inch with an 0.022 inch lumen, a spring 1 inch long compressed ¼ inch exerts 8 ounces of pressure, while an 0.032 inch lumen, 1 inch long spring, when compressed ¼ inch, exerts only 4 ounces, and only 3 ounces on an 0.036 inch lumen. Consequently, all Johnson's findings seem to be substantial.

Whatever our appliance technique, we want a coil spring that will give us a sufficient amount of tooth movement without repeated adjustments, thus saving time. Even more important, however, we strive for a continuous force. Thus, it seems only logical that we are looking for the longest length of spring

possible that we can incorporate in our particular technique. It also should be of the highest elasticity possible. Most of you will agree with Oppenheim's findings that you should not use the same amounts of measured force for all patients. One will be guided by the firmness and sensitiveness of the teeth. Consequently, a spring should be chosen that is capable of exerting a few ounces or a large number of ounces of pressure and will continue to exert that pressure over the longest period of time possible.

In going through the table, one can readily pick out the spring that is most adaptable to his technique. This is done, first, by choosing the longest length possible without interfering with bands or arch wire attachments and, second, by finding the gauge that exerts an average pressure with the correct

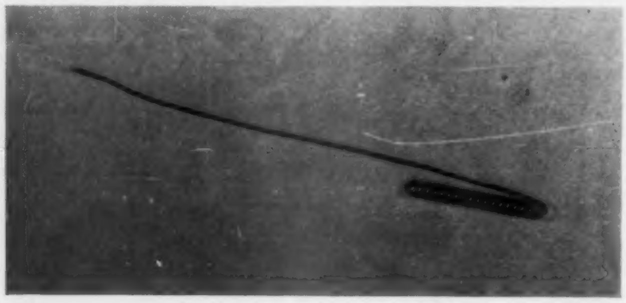

Fig. 2.—Spring after end is doubled back and deadened.

lumen for the arch wire. Thus, if one is retracting a cuspid in an extraction case on an arch wire 0.020 inch in diameter, in looking at the table one sees that he can exert 2 ounces of pressure on a coil spring 1 inch long and 0.006 inch in diameter by compressing it ⅛ inch, or 4 ounces of pressure by compressing it ¼ inch. But, one also notes that a spring 0.009 inch in diameter and 1 inch long can be used, and can exert 7 ounces of pressure when compressed ⅛ inch, and 14 ounces of pressure when compressed ¼ inch. The most logical thing would be to pick a spring midway between the two, probably one 0.008 inch in diameter which exerts 4 ounces and 8 ounces, respectively, when compressed ⅛ or ¼ inch.

Those using larger-gauge arch wires (for instance, an 0.030 inch) can get a 4-ounce pressure from ¼ inch compression of a coil 1 inch long and 0.008 inch in diameter, 8 ounces of pressure from an 0.009 inch, or 12 ounces of pressure from an 0.010 inch coil spring.

One will also note, in checking over the table, that some efficiency may be lost by using an oversized lumen or a spring that is several times too large for the arch wire. The results will not be constant, due to some buckling when the spring is compressed, although, for the most part, the variations will be slight. In general, the best spring would be one where ¼ inch of compression is used to attain the ounce pressure desired, but in as long a spring as is convenient to use.

I should mention here a type of spring that I originated and found to be very efficient and easily adjusted. An 0.008, 0.009, or 0.010 inch spring wire

is wrapped on a Unitek winder over an 0.030 inch wire. One may use any size of core or any diameter of spring wire, and any length suitable to one's need. The finished spring is stretched open to twice its length, and one end is cut off. The other end is deadened by passing it through a flame. The deadened end is then bent back upon itself, as close to the coil as possible, through an angle of 180 degrees. One has now created a push type spring by pulling on it. The spring is then threaded on the arch wire with the cut end placed against the bracket or stop on the arch wire, depending upon the movement desired. The spring is activated by pulling on the deadened end until the correct amount of pressure is reached, and the deadened end is wrapped around the buccal tube of the molar tooth. On consequent sittings, the end is unhooked from the molar tube, given another pull, and replaced around the tube.

A very handy feature of this spring is that it can be used for a space closure in an extraction case when there is more space than needed. When one wishes to do final space closure between the anchor tooth and the teeth mesial to it, the arch wire should be extended about $\frac{5}{8}$ inch beyond the buccal tubes. Then, the spring is placed on the end of the arch wire and pulled forward on the molar, hooking the deadened end mesially to the cuspid bracket or to a stop on the arch wire. The remaining teeth, of course, have been ligated en masse for anchorage.

BASIC SCIENCE AND ITS RELATION TO THE COIL SPRING

It is my belief that a light continuous pressure is the ideal force in tooth movement, and this type of pressure can be accomplished by the coil spring.

In regard to continual pressure, several investigators, like Orban[10] and Gottlieb, favor this type of force rather than the intermittent one. Orban claims that when the effect of pressure disappears, new bone formation appears, depositing uncalcified primary matrix later to be deposited with calcium salts. In the movement of teeth through intermittent force, there exists a period of active movement followed by a period of rest, and during such rest periods the newly formed uncalcified "osteoid tissue" must first be resorbed. His findings seem to indicate that the resistance against resorption in such state of bone is greater and, therefore, the function of the connective tissue is impeded. He maintains that a gentle continual force, even after a long period, does not necessarily retard the resorptive power of the connective tissue, and so he feels that the rest periods are unnecessary. It is his belief that, if the intermittent force as applied in orthodontic appliances can be a well-regulated one like that of the pulsation of blood, it is possible that such a particular type of force may be advantageous. Inasmuch as such a well-regulated force is not possible, except during the action of mastication, the opinion against intermittent orthodontic force prevails.

In describing the mild continuous force working with a gentle springlike mechanism against a tooth through a given amount of space, Orban[10] explains that the springlike action is continuous until the movement of the tooth through that distance is attained. The external influence of occlusion, mastica-

tion, and other muscular factors prevents its ever becoming a true continuous force in the strictest meaning of the word, as these factors act to interrupt the true continuous movement of the tooth through the desired distance.

Oppenheim was long a believer in intermittent force, but before he died he came to much the same conclusion as Gottlieb and Orban that the long continuous mild force was the more physiologic one.

At best, any orthodontic appliance and its accessories may, and in fact probably will, leave some scars. Therefore, the most careful judgment must be used in choosing the accessories best suited for the case in hand and their adaptability to the appliance. Finally, the utmost skill must be used in their manipulation. In addition to mechanical ability, the operator should have a thorough understanding of the biologic nature of the tooth movement in order to prevent injury to tissue.

All the scientific research that has been done in bone development, with regard to orthodontic forces, points to the outstanding fact that if one uses a force that is mild and continuous, the most beneficial reaction is obtained. Therefore, the use of the coil spring would seem to be an ideal adjunct to anyone's appliance therapy. One may obtain any number of ounces of pressure desired, and may do so without removing the arch wire. One is able to judge, by the tissue reaction, the number of ounces he thinks best suited to the case at hand.

SUMMARY

A review of the literature concerning coil springs reveals various criteria for selection and use of coil springs in orthodontics. For example, it is emphasized that the amount of force to be used cannot be set arbitrarily, but must be governed by the firmness and sensitivity of the teeth, while, on the other hand, one operator recommends a coil ¼ inch long adjusted or compressed 1/32 inch on all patients.

A systematic tabulation of data in conventional units is presented, showing the relationship in coil springs between spring diameter, wire diameter, core diameter, amount of compression, and pressure developed.

A method of forming and adjusting coil springs is described wherein spring wire is wrapped around a core of a selected size and stretched to twice its length, one end of the spring being placed against a bracket or stop on the arch wire, and the other end being bent in such a fashion as to be readily accessible for subsequent movement to adjust the spring compression.

Literature is reviewed which indicates the desirability of applying a mild continuous corrective force to the tooth under treatment, the data herein showing that such force can be ideally provided by an elongated coil spring.

CONCLUSIONS

The usefulness of coil springs can be extended by increasing the length of the spring, thus providing a gentle continuous corrective force. With the longer spring, the pressure can be regulated more accurately because a given

change in pressure is obtained with a greater adjustment in length. The frequency of adjustment can also be reduced substantially when a longer spring is used.

By developing one's technique to the use of a certain length of spring, and compressing it approximately the same each time, one may vary his ounces of pressure by going to a smaller gauge of spring wire, and thus become very accurate in his compression adjustments.

The data compiled herein permit a spring of proper size to be quickly chosen for a given set of conditions, although care must be exercised to suit the pressure exerted by the spring to the physiology of the patient, particularly as regards firmness and sensitivity of the teeth.

The spring-forming and adjustment technique described herein permits rapid adjustment of the spring pressure during treatment without removal of the spring, and is useful as a space closure from any position.

The open coil spring seems to provide as nearly an ideal force as anyone would desire, and it is readily adaptable to any appliance therapy. Therefore, it should be utilized by all in the profession, thus bringing the various techniques a little closer together.

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908 JOHNSTONE AVE.

LOCATING IMPACTED CUSPIDS

Using the Shift Technique

George E. Ewan, D.D.S., M.S., Sheridan, Wyo.

LOCATING impacted teeth and imbedded foreign bodies is a problem which, sooner or later, presents itself in virtually every dental office. This problem confronts not only the oral surgeon and the orthodontist, but also the general practitioner. The decision as to just what to do with an impacted tooth, be it surgical removal, orthodontic correction, or nonintervention, may be reached only after the exact location of the misplaced unit is determined. To this end, dental x-ray films are easy to use and must be used freely, constantly keeping in mind that the x-ray film presents a two-dimensional image of a three-dimensional object.

One technique for locating impacted teeth utilizes occlusal films. This technique was described by Mathews[1] and others. Many men in dental practice, however, take very few occlusal pictures, with the result that the film becomes old and produces poor pictures. It follows that the dentist's technique for taking occlusal pictures often becomes rather rusty, since he does not use that technique frequently. The result is unreliable pictures. The shift technique for localizing impacted teeth utilizes standard intraoral film, as used in virtually every dental office, and fresh film can be maintained easily. In addition, every modern dentist has a definite technique for taking intraoral pictures and the shift technique is merely an adaptation of this routine procedure.

We hear much about 3-D these days, and the shift technique merely makes it possible to study a series of intraoral x-ray pictures so that the third dimension (depth) may be interpreted. The principle of the shift technique may be observed in any countryside landscape. Assume that we are out for a Sunday afternoon drive and see a large cumulus cloud approximately one mile away. We also see a tree on a hilltop approximately halfway between the cloud and us (Fig. 1). If this same cloud and tree are viewed from three different positions (Fig. 2, *A*, *B*, and *C*), they have quite different relationships when viewed from each of the different positions. It appears that the cloud, which is the more distant object, has been moving in the same direction that we were moving as we changed our position from point *A* to *B* to *C*. Actually, in making x-ray views of an impacted tooth and its adjacent structures to be used in the shift technique, we change the position of the x-ray tube so that we view the same

The illustrations used in this article were made by Dave McIntosh, Sheridan, Wyoming.

Fig. 1.

Fig. 2.

structures from three diverse positions, much the same as we viewed the cloud and the tree from three different positions in Fig. 2. This gives us pictures of the related structures from three contrary points of view. As, in Fig. 1, the

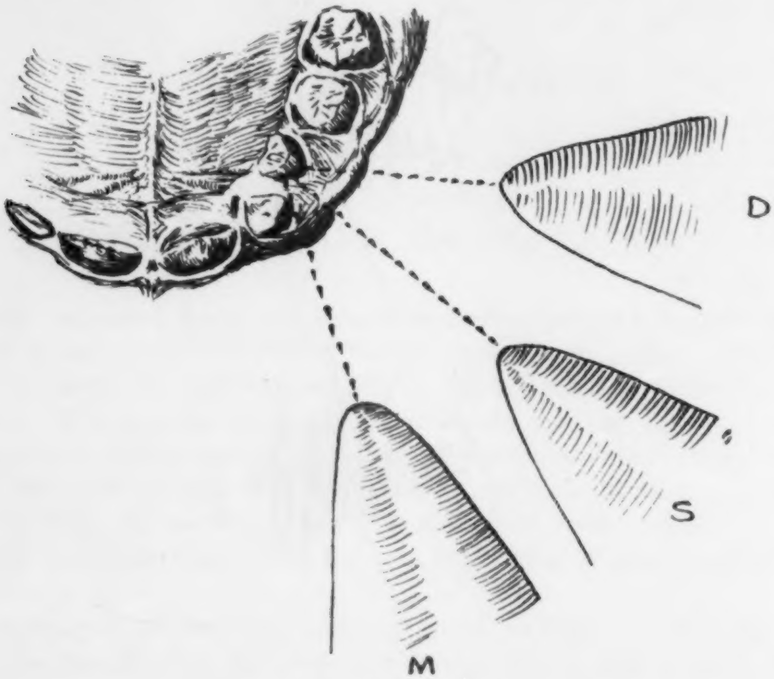
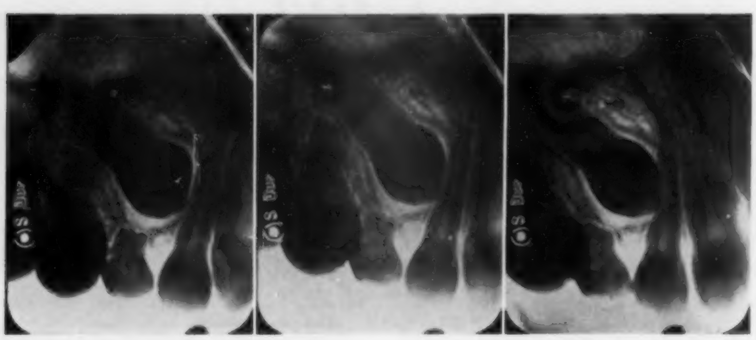


Fig. 3.



A. *B.* *C.*

Fig. 4.—Upper right cuspid in lingual position, as viewed from the labial. *A*, Distal; *B*, straight; *C*, mesial.

cloud, which is the more distant object, appeared to move with us as we moved from *A* to *C*, so a lingually impacted tooth, being farther from the x-ray tube than its neighboring structures, will appear to move with the x-ray tube as it moves from a mesial position to a more distal position. If, however, the impacted tooth is in a labial or buccal position, the reverse will be true. Always the more distant object will appear to move in the same direction that we move as we view the pictures.

The shift technique may be outlined as follows:

1. Three views of the same area are made from three positions; one from the mesial, one straight toward the area (standard view), and the third from a distal position (Fig. 3). These films are labeled and kept separate during developing.

2. The films are mounted and labeled "mesial," "straight," and "distal." They are viewed from the labial or buccal side (Fig. 4).

3. The impacted tooth or foreign body will have a distinct relationship with its adjacent structures in each of the three views, due to the repositioning of the x-ray tube for each view.

4. The object which appears to have moved in the same direction that the x-ray tube was moved is the deeper object or is lingual to the adjacent structures.

Disadvantages of the Shift Technique.—

Three different films must be made of the same area, and these must be labeled to show the position of the x-ray tube for each view.

2. Films must be mounted and labeled to show the position of the x-ray tube at the time each view was made.

3. Films must be viewed from the labial side. This is a disadvantage only since x-ray films in many offices are mounted to be viewed from the lingual side.

Advantages of the Shift Technique.—

1. It utilizes films that are available and fresh, and the technique used is the same as that used in virtually every dental office.

2. It positively localizes an impacted tooth or an imbedded foreign body.

3. It provides true perspective of the impacted tooth and its related structures.

While there still remains the decision as to what to do with an impacted tooth, certainly the first step in reaching that decision must be to locate it definitely in relation to the surrounding area. Then, and only then, can a sound decision concerning its disposition be made.

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BANK OF COMMERCE BLDG.

CENTENNIAL OF THE BIRTH OF DR. EDWARD H. ANGLE

Earl W. Swinehart, D.D.S., Baltimore, Md.

IT IS most fitting at this time that we, as a group of orthodontists, should pause, consider, and pay deserved tribute to Dr. Edward Hartley Angle in this, the one-hundredth anniversary year of his birth. This should be done with the deepest gratitude, as there is little in dental history to indicate that there would now be world-wide specialization and organization by capable orthodontists, except for the genius of this man.

It has been said, "Genius consists of 3 per cent inspiration and 97 per cent perspiration," but it is impossible in all cases to determine the relative values of these two requisites. In this instance, the history of the profession reveals that, through hundreds of years, many men with fine, educated minds and lofty purposes had left meticulous records of their words and ideas. However, they failed to pass on to their successors any definite and workable systems of procedure in orthodontic practice. After these many comparatively fruitless generations, there suddenly appeared on the scene, in 1878, a young graduate, Dr. Edward H. Angle, who already had a true and comprehensive vision of the past, present, and future of orthodontic problems. In that vision, there were revealed to him the tremendous potentialities for human good that had been wasted through failure to treat malocclusion understandingly. Also, it was obvious to him that this was due to neglect on the part of schools and appropriate organizations to select and train men to perform this very important, undeveloped dental service. Later he stated: "In 1880 I had become very much interested in orthodontia, and I came to believe that some time, perhaps after a long time, orthodontia would be practiced as a specialty, for it seemed to me that its importance entitled it to a closer study and application in practice and that only would enable anyone to become sufficiently familiar with its principles and master its technique, to overcome its difficulties and be successful in its practice. This conviction has constantly grown upon me in the years that have followed. In 1896, I advocated its teaching and practice as a specialty in a paper read before the Western Pennsylvania Dental Association."

It was in accordance with this educational concept of the problem that Dr. Angle spent much time in teaching in dental colleges and in writing papers and books. His hope was that the schools in time would come to see the wisdom of increasing their efforts in this respect. However, the results were so disappointing after seventeen years of such sacrifice that he resigned in

Presented at the luncheon commemorating the centennial of Dr. Edward H. Angle's birth, Middle Atlantic Society of Orthodontists, Washington, D. C., Oct. 5, 1955.

1898 in a very depressed state of mind. He then tried to have these schools give short special courses in orthodontics, but they replied that his request was "too Utopian." This seeming impasse soon turned out to be a blessing in disguise because, during that summer, four bright young dentists approached Dr. Angle at a meeting of the American Dental Association and asked if he would give them an intensive three-week course in orthodontics in his own office. Working with these eager, intelligent, and purposeful young men was a revelation to him, as it indicated the one logical course to the fulfillment of his dreams.

It would be most appropriate at this time to set forth in detail at least a few of Dr. Angle's many contributions to the welfare of humanity and our profession. The limited time at our disposal will not permit this but, for the benefit of the young men coming into the profession, to whom he probably is merely a legend, I wish to present (with a little explanation) a list of some of the contributions made by this benefactor of mankind. These have been set forth in Weinberger's book entitled *Orthodontics, An Historical Review of Its Origin and Evolution* (published in 1926 by The C. V. Mosby Company, St. Louis). Intelligent appraisal of this partial list reveals the tremendous influence that Angle had as the founder and developer of scientific orthodontics. From 1886 to 1899 these contributions were mostly technical in character, aimed at attracting the attention of the indifferent dental schools and in awakening the interest of as many dentists as possible. It will be recognized that he later discarded various of these inventions and replaced them with more efficient mechanisms. Nevertheless, they are mentioned to illustrate the evolution of Angle's technical skill as his concept of the theory of orthodontics developed.

The list is as follows:

1886.—Introduction of metal tubes soldered to bands, providing a "simple, compact and ready means of attachment between the bands and working appliances." *Prior to that time, the working appliances were either ligated to the anchor teeth or soldered to cemented anchor bands. It is impossible even to estimate the great value of this early change in technique.*

1887.—Probably first Angle edition entitled "Irregularities of the Teeth" (Ninth International Medical Congress).

1887.—Introduction of nickel silver (German) in construction of orthodontic appliances.

1887.—Introduction of the traction screw.

1887.—Introduction of stationary anchorage. *This basic principle is still of vital importance in modern-day treatment.*

1889.—Introduction of the first set of Angle's appliances.

1890.—Introduction of silver solder.

1890.—The second edition of Angle's book entitled "A System of Appliances for Correcting Irregularities of the Teeth."

1891.—Introduction of a form of occipital anchorage.

1891.—Introduction of occlusal anchorage.

1892.—The third edition of Angle's book entitled "The Angle System of Regulation and Retention of the Teeth."

1892.—Introduction of the adjustable clamp band. *This was extensively used by the profession for a number of years.*

1894.—Introduction of Angle impression trays.

1895.—Introduction of soft brass ligature wires.

1895.—Introduction of wire pinches, under a new method of applying force in regulating teeth.

1895.—Fourth edition of "The Angle System of Regulation and Retention of the Teeth," with an addition of "Treatment of Fractures of the Maxillae."

1898.—Introduction of band-forming pliers.

1899.—Fifth edition of "The Angle System of Regulation and Retention of the Teeth and Treatment of Fractures of the Maxillae."

1899.—Introduction of Resection of Frenum Labii.

1899.—Introduction of a form of head gear.

1899.—Introduction of a form of chin retractor.

1899.—Introduction of the Classification of Malocclusion. *Certainly this has been one of the milestones in orthodontic progress. It has done much toward bringing order out of chaos and has made world-wide professional communication and treatment more understandable and practicable.*

1899.—Introduction of the friction sleeve nut. *This, together with the adjustable clamp band and threading the arch ends, became a valuable accessory to a greatly improved labial arch system. This technique, later utilizing plain anchor bands, soon came into general use and remained the standard for years as the science advanced. With minor refinements, it is still employed extensively at the present time. Also, it is mechanically evident that many of the more complicated techniques in use today owe their existence to the principles of this basic appliance.*

1900.—Sixth edition of Angle's book entitled "Malocclusion of the Teeth."

1900.—Establishment of the Angle School of Orthodontia. *After twenty-two years of apparently fruitless dreaming and striving, the prospect of a school, filled with chosen men eager to learn what he knew how to teach, rekindled the orthodontic vision of Dr. Angle's youth. Under these favorable circumstances he, with knowledge and foresight, organized an earnest and capable faculty. Angle himself became known as one of those rare teachers who not merely passed out knowledge, but lighted fires in the minds of his students that continued to burn throughout their professional lives.*

1901.—Organization of the American Society of Orthodontists. *Thus was founded for the first time a national organization of dentists interested in promoting the growth and success of orthodontics.*

1902.—A paper entitled "Some Basic Principles in Orthodontia."

1902.—Metal ligatures in orthodontia.

1902.—Introduction of specialization of orthodontia.

1903.—Introduction of normal occlusion—the full complement of teeth, and the theory that each tooth shall be made to occupy its normal position. *This concept set up for the budding profession a series of ideals which had never before existed.*

1905.—Introduction of the upper first molar as a basis of diagnosis.

1907.—Seventh edition of Angle's book entitled "Malocclusion of the Teeth." *Vital to the birth and growth of modern orthodontics have been the successive editions of this text. From the first, published in 1887, to the last, in 1907, they lighted the pathway, as each succeeding one reflected the rapidly growing basic understanding and technical knowledge of the author.*

1907.—Establishment of "The American Orthodontist," *the first journal devoted exclusively to publication of the affairs of orthodontics. This completed the tripodal foundation of school, society, and literature, on which professions must be based if they are to live and thrive. This undoubtedly was Angle's greatest contribution, for which the memory of his name will live through the years ahead, as the specialty of orthodontics continues to grow in size and proficiency. After completing his master stroke of organization, Dr. Angle again turned mainly to invention.*

1910.—Introduction of the working retainer.

1911.—Introduction of the pin and tube appliance.

1913.—Introduction of the ribbon arch appliance.

1923.—Establishment of the Angle College of Orthodontia in Pasadena, California. *From Angle's workshop in connection with this college came new band-forming pliers, ligature-tying pliers, and a number of new and useful instruments of much value in modern orthodontic practice.*

1924.—Introduction of the edgewise arch mechanism. *This last great technical achievement of Dr. Edward H. Angle is so familiar to most of you that even now, thirty-one years later, further comment upon it would be superfluous.*

The foregoing is, of course, only a partial list of the major contributions Dr. Angle made to the profession. However, it must be obvious that, while the numerous minor details of technical advice (of which he gave so freely) might not be considered of great importance individually, in aggregate they constituted what we today call "know-how." He was a tireless and meticulous worker and had a long and extremely busy life. The following words, spoken by him shortly before his death, seems entirely in character: "I have finished my work. It is as perfect as I can make it."

His accomplishments were many and varied, and thousands of words might well be spoken in acknowledgment of the debt of gratitude owed to this man by the patients and practitioners of orthodontics. However, in concluding this brief tribute to Dr. Edward Hartley Angle, no more fitting words come to mind than those already voiced by his co-teacher and intimate scientific friend, Dr. Raymond C. Osburn: "A pioneer, patriarch, and prophet in his chosen field of work, he combined the imagination of the inventor, the skill of the artist, the experimentation of the scientist, and the insight of the philosopher. To very few men has it been given to perfect to so great an extent both the principles and the technique of any subject." Among the deeds that men can do, there are not many more praiseworthy than the founding of a self-multiplying and self-improving agency for bettering the health, happiness, and efficiency of human beings.

MEDICAL ARTS BLDG.

In Memoriam

CLINTON CHAPPELL HOWARD

1884—1955

CLINTON CHAPPELL HOWARD was born on Oct. 22, 1884, at Selma, Alabama, and died July 16, 1955, in Miami, Florida.

Dr. Howard was the son of Dr. and Mrs. T. G. Howard, his father having been one of the outstanding medical practitioners of Alabama.

After his high school education, Dr. Howard attended Birmingham-Southern College, Birmingham, Alabama, but he withdrew from college shortly before the completion of his senior year. His decision to study dentistry came after many months of discussion, for he came from a family of physicians and it was the wish of everyone that he follow in his father's footsteps. He was graduated in 1907 from the Dental Department of the University of Southern California, after which he located and practiced general dentistry in Huntsville, Alabama, for four years. During that time he married Miss Belle Barber of Selma.

Dr. Howard was graduated from the famous Angle Class of 1911, at New London, Connecticut, and later in that year he located in Atlanta, Georgia, where he practiced orthodontics until his retirement in 1942.

Early in his orthodontic career, it became evident that our profession had a new and liberating force, and as the years went on the rapid and forceful development of his inquiring mind was made manifest in many avenues. It has been said by his classmates that he had one of the most brilliant minds of the era; that brilliance and his thoroughness were soon made evident. He knew the rules and the fundamentals, and he was not long in breaking down the empirical traditions of the early history of the orthodontic profession.

Early in his professional career, he was active in the establishment of the Good Samaritan Endocrine Clinic in Atlanta; he worked there with Elkins and served on the staff for eighteen years. The foundation laid there and the opening of a new field of research led him on from year to year, and the brilliant and valuable contributions that he made to orthodontic literature spoke for themselves. Among the many honors that he received, the most outstanding was recognition for what is known in medical circles today as the Howard Syndrome. This one phase of his many-sided life would consume more time than can be allowed here, and will undoubtedly receive proper recognition from other sources.

His only professional appearance after his retirement in 1942 was when he attended the American Association of Orthodontists meeting at Columbus, Ohio, and was presented with the Ketcham Award by the American Board of Orthodontists. This was a very proud and happy occasion in his life, for Albert Ketcham was one of his ideals.

He was presented a gold card as a Life Member of the Fifth District Dental Society, being the only man holding that honor.

Early in his career, he was contributing to orthodontic literature and he did this until the time of his retirement. The following is a partial list of his contributions:

A Brief Review of Certain Histological and Etiological Factors Entering into the Treatment of Malocclusion, Reprint from Alabama Dental Transactions Session, 1914.

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A Preliminary Report of Infraocclusion of the Molars and Premolars Produced by Orthopedic Treatment of Scoliosis, INT. J. ORTHODONTIA **12**: May, 1925.

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A Résumé of Four Years of Study at the Good Samaritan (Endocrine) Clinic With Special Reference to Seven Hundred X-ray Hand Pictures and Their Relation to General Bone Progress, INT. J. ORTHODONTIA **14**: 91, February, 1928.

A Discussion of Infra- and Supraversion, INT. J. ORTHODONTIA **16**: 1019, October, 1930.

A Phase of Skeletal Growth as Influenced by the Sex Hormones, INT. J. ORTHODONTIA **18**: 659, July, 1932.

Acromegaloid Growth and Dwarfism, INT. J. ORTHODONTIA **22**: 992, October, 1936.

Growth. Ossification of the Bone Centers of the Hand as Correlated With General Growth Stages, INT. J. ORTHODONTIA **22**: 888, September, 1936.

President's Address, INT. J. ORTHODONTIA **12**: 301, April, 1926.

A Study of Jaw and Arch Development Considered With the Normal and Abnormal Skeleton, INT. J. ORTHODONTIA **12**: January, 1926.

President's Society Address, INT. J. ORTHODONTIA **8**: 403, March, 1922.

Radiodontia in Orthodontia, INT. J. ORTHODONTIA **10**: 815, 1924.

Glandular Influence Considered in Skeletal Development, INT. J. ORTHODONTIA **11**: 214, 1925.

Second Report on Scoliosis, INT. J. ORTHODONTIA **15**: 329, 1929.

Value of Survey on Orthodontic Diagnosis, INT. J. ORTHODONTIA **12**: 613, 1926.

His interest in dentistry was far reaching. He was one of the first members of the Atlanta Mid-Winter Clinic, serving with its founder, Dr. Thomas P. Hinman. This Clinic later was named for Dr. Hinman during his lifetime, and Dr. Howard, after the death of Dr. Hinman, was the third chairman and served in that capacity many years, making noble contributions to the improvement of dentistry in the Southeast. He was one of the founders and first president of the Southern Society of Orthodontists, the organization closest to his heart. He felt a personal pride in its accomplishment, loving it and each member with all his heart. He served as president of the Fifth District Dental Society, the Georgia Dental Association, and the American Association of Orthodontists.

The latter part of his professional life was devoted to instituting reforms in dental education, and this alone would make a monumental study. The

efforts of Dr. Howard and his fellow workers influenced the establishment of the Council on Dental Education of the American Dental Association and the subsequent movements which have been so far reaching in educational reforms.

He was an ardent sportsman. One of the organizers of the Peachtree Gun Club, for a long time he was in the championship class in both trap and skeet shooting. Throughout his life he was a hunter and a fisherman. Quail hunting was the delight of his heart and he was an expert shot, behind the dogs and also in a dove field, and very few huntsmen excelled him in shooting ducks and geese. He followed this sport throughout the Gulf Coast and the Carolina Coast.

His love of the outdoors led him into the study of Nature, and he was one of the best-informed naturalists in our profession. As proof of his ardor, his collection of wild life was as near perfect as any private collection. In 1939 this collection was shown by the State Game and Fish Department of Georgia at the New York World's Fair.

His pastime led him into interesting spheres. I have heard him many times, when attempting to analyze some of the unaccountable things in our profession, repeat the philosophic comment of the old Florida cracker deer guide when Howard was observing some incongruity in Nature that puzzled him: "Doc, don't let that worry you. Don't you know there ain't no sense to anything nohow?" This furnished him an answer to many perplexities.

When faced with a new problem or a new endeavor, no one could prophesy what he would do. In testimony of this, I would like to quote from an attendant of the Denver Seminar:

"Clint Howard lectured before the Denver Summer Seminar for Advanced Orthodontics for five consecutive years. During these years, his wealth of material on normal, retarded, and accelerated growth constantly confounded his listeners. And not one time during these hours of lectures did Clint Howard, a master technician, show one single slide on appliance technique. His message was concerning the necessity of correlating appliance manipulation with the general physical changes and that orthodontics was not merely mechanical manipulation."

Mrs. Howard died many years before Dr. Howard. Today he is survived by his only child, Mrs. Anthony Drexel, III, of Nassau, Bahamas; three grandchildren, Anthony Drexel, IV, Howard Drexel, and Diane Drexel; and one brother, Dr. Leon Howard of Denver, Colorado.

Clint Howard was a genius with all the peculiar talents, knowledge, skills, and foibles of the great. His mind was a storehouse of knowledge on a wide range of subjects. He had his own great imagination; no one gave him that. He had his own professional genius; no one conferred that upon him. Many people influenced his life but, after all, those who knew him best felt that he was completely responsible for his own unmatched career.

When orthodontics was a new frontier, he devoted his entire thought and life to searching out and blazing trails that lesser men have followed. Once the wilderness was opened and the paths surveyed, he seemed to lose his zest for the search. At times, when friends came with problems, the old spark would flash again. He never entirely lost his interest in and love for orthodontics.

Something about him charmed even the casual acquaintance. To know him was to love him. He was happy with princes or paupers, and they were all pleased with him. His professional brothers will long remember Clint Howard.

Myself when young did eagerly frequent
Doctor and Saint, and heard great argument
About it and about: but evermore
Came out by the same door where in I went.

With them the seed of wisdom did I sow,
And with mine own hand wrought to make it grow;
And this was all the Harvest that I reap'd—
"I came like water, and like wind I go."

—*Omar Khayyám.*

BE IT RESOLVED that this tribute be made a part of the permanent records of the Southern Society of Orthodontists and that copies be sent to the family of Dr. Clinton Chappell Howard.

Respectfully submitted,

J. Doyle Smith, D.D.S.
Glenn Phillips, D.D.S.
Thad Morrison, Sr., D.D.S., Chairman,
Necrology Committee,
Southern Society of Orthodontists

BEULAH G. NELSON

1896—1955

BEULAH G. NELSON of Oak Park, Illinois, died at her home on Wednesday, July 6, 1955, after an illness of five months. Funeral services were conducted at the First Congregational Church from Haggard Chapel, with the Rev. Telfer Mook officiating. Interment was private.

Dr. Nelson, daughter of the late Charles L. and Marietta Nelson, was born in Iroquois, Illinois, Oct. 9, 1896. Nine years later her family moved to Hutchinson, Kansas, where she was graduated from high school in 1914. The next few years she taught in the elementary schools of Hutchinson and Pretty Prairie, Kansas, in order to pay her college expenses. She received her bachelor of arts degree from Northwestern University, after which she worked at the Presbyterian Hospital in Chicago as diet secretary for Dr. Rollin T. Woodyatt. It was at this time that she decided to study dentistry. Further preparatory effort gave her a bachelor of science degree in 1928 from the University of Illinois, where she also was graduated in dentistry in 1930.

For several years she was associated with Dr. Edgar D. Coolidge, as well as being a part-time instructor in the children's dental clinic at the University of Illinois, after which she attained her master of science degree and began practicing in Oak Park, Illinois. Since 1945 she had limited her practice to orthodontics.

Dr. Nelson was a member of the Chicago Dental Society, Illinois State Dental Society, American Dental Association, Chicago Association of Orthodontists (president in 1951), Edward H. Angle Society of Orthodontists (vice-president, Western Division, in 1955), Charles H. Tweed Foundation of Orthodontic Research, American Association of Orthodontics, Kappa Delta sorority, Omicron Kappa Upsilon honorary dental fraternity, Upsilon Alpha dental sorority, Zonta International, Religious Society of Friends (Quakers), American Friends Service Committee of Chicago, and United World Federalists.

In the passing of Dr. Nelson we have lost a good friend and a valuable member. Her cordial disposition was a tonic to those who knew her. Her literary and clinical contributions to the specialty bespoke the efficacy of an indefatigable personality.

The entire membership of the Central Section of the American Association of Orthodontics extends sincere sympathy to her surviving family. May this resolution be included in our records and copies be sent to Dr. Nelson's three brothers.

H. B. Singler
Joe M. Pike
Leonard P. Wahl, Chairman,
Necrology Committee.

WILLIAM A. MURRAY

1895—1955

IT IS with deep regret that we note the passing of one of our good friends, Dr. William A. Murray.

He was born in Toronto, Canada, on Aug. 20, 1895, the son of the Reverend and Mrs. Roderick Murray.

His preliminary education began in Evanston, Illinois, and was completed at the Lake View High School in Chicago in 1913. He was graduated from Northwestern University Dental School in 1916, after which he served as Instructor in Prosthetics at his alma mater. He also served in the Dental Corps of the United States Army during this period.

While a dental student, he worked as desk clerk at the Central Y.M.C.A. in Chicago every night until 11 o'clock.

Dr. Murray began the practice of general dentistry in Evanston in 1918. After three years he decided to become an orthodontist. He completed the graduate course at the Dewey School of Orthodontics in 1921 and thereafter limited his practice to orthodontics in Evanston. Years later he established a branch office in Highland Park.

He was a Fellow of the International College of Dentists and Diplomate of the American Board of Orthodontics.

He was a member of the Chicago Dental Society, Illinois State Dental Society, American Dental Association, American Association of Orthodontics, Central Section of the American Association of Orthodontists, Southern Society of

Orthodontists, Southwestern Society of Orthodontists (honorary member), Chicago Association of Orthodontists, Evanston Association of Dentists, Lake County Dental Society, Delta Sigma Delta fraternity, Evanston Club, University Club of Evanston, and Exmoor Golf Club.

He served as president of the following organizations: Evanston Association of Dentists, 1929-1930; American Association of Orthodontists, 1940; Chicago Association of Orthodontists, 1942-1943; North Suburban Branch of the Chicago Dental Society, 1944; and Rotary Club of Evanston, 1945.

WILLIAM A. MURRAY

Dr. Murray died in the Evanston Hospital on Sept. 19, 1955, after a short illness. His death was a severe shock to his many friends. We have lost a good friend and a valuable member, whose ability and willingness to serve have been important factors in our organization and have contributed to the advancement of orthodontics.

The entire membership of the Central Section of the American Association of Orthodontists extends sincere sympathy to his family. May this resolution be included in our records, and copies be sent to his widow, his parents, and his sister.

JOE M. PIKE
H. B. SINGLER
LEONARD P. WAHL, Chairman,
Necrology Committee

ROGER DAVIES PROSSER
1911—1955

ROGER DAVIES PROSSER was born in Ridgeland, Mississippi, on Oct. 6, 1911, and died in Lakeland, Florida, on July 30, 1955.

Dr. Prosser was graduated from high school in Canton, Mississippi. He did his predental work at Millsaps College in Jackson, Mississippi; he was graduated from the University of Tennessee, College of Dentistry in Memphis in 1935, with the highest average, and received the Faculty Medal. He also did postgraduate work at the University of Tennessee and office study with various men. Dr. Prosser did general practice in Como, Mississippi, and in 1940 moved to Florida, where he practiced orthodontics.

He was a member of Delta Sigma Delta dental fraternity and Sigma Alpha Epsilon social fraternity.

The Southern Society of Orthodontists is deeply grieved at the untimely death of this promising young member of the orthodontic specialty. In the passing of Dr. Roger Davies Prosser, we have lost a member whose professional character and accomplishments have reflected the highest honor upon our Society and the dental profession. As an example of his devotion to his profession and his friends, he made periodic trips to Jacksonville to assist in the care of patients during the illness of Glenn Phillips. He will be greatly missed by his wealth of friends in Florida and by the members of the orthodontic profession throughout the Southeast. The sincere sympathies of the Southern Society are extended to his family.

Dr. Prosser is survived by his widow, Kathryn; three children, Pricilla, Kayren, and Arthur Myers Prosser; his mother, Mrs. William F. (Helen D.) Prosser of Lakeland; and a brother, John F. Prosser of Lakeland.

BE IT RESOLVED that this tribute be made a part of the permanent records of the Southern Society of Orthodontists and that a copy be mailed to Dr. Prosser's widow.

Respectfully submitted,
J. Doyle Smith, D.D.S.
Glenn Phillips, D.D.S.
Thad Morrison, Sr., D.D.S., Chairman,
Necrology Committee,
Southern Society of Orthodontists.

I. V. WOOD
1911—1955

I. V. WOOD was born on Aug. 4, 1911, in Mobile, Alabama, and died on June 25, 1955, at Point Clear, Alabama.

He attended Tulane University; he received his D.D.S. degree from Loyola University in New Orleans and a Certificate of Orthodontia from Harvard Post-Graduate Dental School.

The tributes to Drs. Prosser and Wood were presented to the Southern Society of Orthodontists, Charlotte, North Carolina, September, 1955.

He was a member of Sigma Alpha Epsilon social fraternity, Delta Sigma Delta professional fraternity, Southern Society of Orthodontists, First District Dental Society, Alabama Dental Society, Mobile Chamber of Commerce, Athelstan Club, Mobile Power Squadron, and Mystic Societies. He was also a member of the Government Street Presbyterian Church.

Dr. Wood was a widely known Mobile dentist and a member of a prominent Mobile family. He died unexpectedly at his summer home at Point Clear, apparently of a heart attack.

The Southern Society of Orthodontists suffered a great loss in the passing of this young man. We can ill afford to lose from our ranks men who have served us so faithfully, who have been so devoted to the orthodontic profession, and who have had such a brilliant future before them. We, like the rest of his host of friends, are deeply grieved and wish to extend to the bereaved family our sincere sympathies.

Dr. Wood is survived by his wife, Mrs. Janella Jackson Wood; a daughter, Miss Janella Wood; his mother, Mrs. I. V. Wood, Sr., of Mobile; and other relatives in Mobile and Point Clear.

BE IT RESOLVED that this tribute be made a part of the permanent records of the Southern Society of Orthodontists and that a copy be mailed to Dr. Wood's widow.

Respectfully submitted,
J. Doyle Smith, D.D.S.
Glenn Phillips, D.D.S.
Thad Morrison, Sr., D.D.S., Chairman,
Necrology Committee,
Southern Society of Orthodontists.

Erratum

In the article by Samuel Pruzansky entitled "Factors Determining Arch Form in Clefts of the Lip and Palate" which began on page 827 of the November issue of the Journal, Fig. 18 on page 845 should be reversed as to top and bottom.

Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

Abstracts Presented Before the Research Section of the American Association of Orthodontists, San Francisco, May 11, 1955

A Radiographic Investigation of the Temporomandibular Joint in Class III Malocclusion (Read by Title): By Francis John Furlong, Northwestern University Dental School, Chicago, Ill.

The purpose of this study was to investigate certain morphologic and functional characteristics of the temporomandibular joint as revealed by cephalometric and oriented temporomandibular radiographs in a group of twenty-two subjects possessing Class III dental malocclusion. It was the further purpose to compare results here obtained with similar measurements from a large group of normal subjects studied by Donovan. In each of the twenty-two cases, temporomandibular radiographs were taken with the mechanism developed by Donovan, and cephalometric radiographs were taken with the Broadbent-Bolton cephalometer. Composite tracings of these radiographs were then prepared and the following measurements were recorded: the freeway space, condylar height, condylar depth, total change in condylar position, vertical change in condylar position, horizontal change in condylar position, fossa form and shape, condyle position in the fossa, incisive path, and condylar paths. These measurements were then compared statistically with similar measurements recorded by Donovan. The results can be best summarized by listing certain characteristics of the Class III group as compared to the normal group. (1) The freeway space, or interocclusal clearance, is wider. (2) The condyle at the rest, occlusal, retruded, and incisive positions is approximately at the same height in the cranium. (3) The condyle at the rest, occlusal, and retruded positions is at approximately the same depth in the cranium. (4) There is very little retrusive range of movement beyond the occlusal position, in very definite contrast to the ability of the normal group to retrude easily beyond the occlusal position. (5) The eminence height is shorter, indicating shorter and flatter eminences. (6) The condyle is in the same relative position in the fossa at the rest position. (7) The path of closure is upward and forward to the same degree as in the normal group.

A Study of Dentofacial Morphology in Esthetic Occidental Whites Based Upon Anthropologic Racial Criteria, Employing Cephalometric Radiography, Photography, and Casts of the Dentition. By Edward A. Lusterman, D.D.S., Fort Greene Health Centre, Bureau of Dentistry, Department of Health, New York, N. Y.

This study was suggested by the fact that classification, diagnosis, and treatment planning in clinical orthodontics are intimately concerned with facial esthetics. The purpose of the study is to determine whether, in sub-

jects with clinically excellent dentitions and good facial esthetics, definitive relationships can be established anthropologically, through seriation of subjects based on racial classification.

The material consisted of 125 girls, between 12 and 18 years of age, selected from New York City schools, who conformed to the requirements of excellent occlusion and orthognathous faces. These were seriated in accordance with anthropologic standards. Cephalometric roentgenology was employed to correlate hard and soft tissue detail, making possible a study of the patterns of the facial skeleton, the denture, and the physiognomy. Oriented profile and full-face photographs were taken. Casts of the teeth were made to study and classify types of arch form.

This study was conducted in the Fort Greene Health Centre, under the auspices of the New York City Department of Health, Bureau of Dentistry.

A Study to Determine the Degree of Vitality of the Permanent Teeth in Connection With Orthodontic Treatment: By Nils-Åke Nordh, L.D.S., Department of Orthodontics, Northwestern University Dental School, Chicago, Ill.

The purpose of this investigation was to determine the changes in degree, if any, of the pain threshold value of the permanent teeth in connection with orthodontic treatment.

The study was carried out on clinical patients, selected at random, and included thirty-two persons (twenty-four females and eight males), ranging in age from 9 to 22 years. A total of 486 teeth were tested at different stages of the orthodontic treatment, before treatment, before and after the placement of orthodontic bands, before and after extractions, and after spaces were closed. In connection with the orthodontic treatment, thirty-five extractions were performed.

The method used to determine and measure the pain threshold of the teeth was electrical excitation of the pulp by means of an electrical stimulator, which was identical to the one used by Björn (1946). It operated by anode batteries and had a current range of 0-140 microamperes. The current produced by the machine consisted of short direct current impulses with a rectangular wavefront and a duration of approximately 10 milliseconds. The pain threshold value was measured in amperes.

It was found that the placement of an orthodontic band did not change the pain threshold value of the teeth.

Extraction of individual teeth decreased the irritability of the teeth adjacent to the site of extraction. There was a significant difference at the 5 per cent level of the pain threshold value obtained after the extractions, but there was a tendency to return to the original values.

In some cases (seven) tooth movement had an unfavorable influence on the pain threshold value in that the irritability was reduced completely. It was indicated, however, that this change was of a temporary duration.

(Additional abstracts presented before the Research Section of the American Association of Orthodontists in May, 1955, will appear from time to time in forthcoming issues of the Journal.)

News and Notes

1956 Prize Essay Contest, American Association of Orthodontists

Eligibility.—Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry or associated with it as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

Character of Essay.—Each essay submitted must represent an original investigation and contain some new significant material of value to the art and science of orthodontics.

Prize.—A cash prize of $500.00 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if, in its judgment, none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

Specifications.—All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced with at least 1 inch margins. Each sheet must be numbered and bound or assembled with paper fasteners in a "brief cover" for easy handling. Three complete copies of each essay, including all illustrations, tables, and bibliography, must be submitted. The name and address of the author must not appear in the essay. For purpose of identification, the author's name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.) should be typed on a separate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

Presentation.—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held at the Statler Hotel, Boston, Massachusetts, the week of April 29, 1956.

Judges.—The entries will be judged by the Research Committee of the American Association of Orthodontists.

Final Submission Date.—No essay will be considered for this competition unless received in triplicate on or before Jan. 10, 1956, by Dr. Thomas D. Speidel, University of Minnesota, School of Dentistry, Minneapolis 14, Minnesota.

H. I. Margolis, Chairman, Research Committee
American Association of Orthodontists
311 Commonwealth Ave.
Boston 15, Massachusetts

American Association of Orthodontists, 1956 Research Section Meeting

Continuing the policy of recent years, the program will consist of a series of ten-minute research reports which may be presented orally or read by title only. All persons engaged in research are urged to participate in this program, which will be held on April 29 and 30 and May 1 and 2, 1956, in the Statler Hotel, Boston, Massachusetts.

Each participant is asked to prepare a 250-word abstract for publication in the AMERICAN JOURNAL OF ORTHODONTICS. Abstract for publication and the ten-minute oral presentation at the meeting should be carefully prepared to present an adequate description of the import of your investigation.

Forms for use in submitting the title and 250-word abstract of your research will be sent to each dental school orthodontic department and to any individual requesting one. Please send your title and abstract as early as possible, but not later than Jan. 10, 1956, to Dr. J. William Adams, 707 Bankers Trust Bldg., Indianapolis 4, Indiana.

H. I. Margolis, Chairman, Research Committee
American Association of Orthodontists
311 Commonwealth Ave.
Boston 15, Massachusetts

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Statler Hotel in Boston, Massachusetts, April 24 through April 28, 1956. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. Wendell L. Wylie, University of California School of Dentistry, The Medical Center, San Francisco 22, California.

Applications for acceptance at the Boston meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1956. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least three years.

Central Section of the American Association of Orthodontists

The eighteenth annual session of the Central Section of the American Association of Orthodontists began with an informal get-together at the Savery Hotel in Des Moines, Iowa, on Sunday, Oct. 2, 1955. The members of the Local Arrangements Committee, together with their charming wives, made this an outstanding event.

Monday, October 3

The formal meeting, with President Yost presiding, began with the invocation by the Reverend Elmer E. Johnson, Rector of St. Luke's Parish Episcopal Church, Des Moines.

President Yost then delivered the presidential address.

B. Holly Broadbent of Cleveland, Ohio, presented a treatise entitled "Serial Cephalometric Records in Diagnosis and Treatment."

Following the noon luncheon, the first business meeting of the session was held. After the routine reports by the secretary and treasurer, Elmer F. Bay, chairman of the Board of Censors, presented the names of thirteen applicants for active membership and fifteen applicants for associate membership. These applicants were then voted into their respective membership categories.

The ladies, after a Continental Breakfast in the West Room of the Savery Hotel and a morning of shopping, were entertained at a luncheon at Younkers' Tearoom.

At 2 P.M. Waldo O. Urban of Evanston, Illinois, presented a paper entitled "Selection of Cases for Mixed Dentition Treatment."

Next came a timely presentation, "Early Expansion of the Deciduous Arches and Its Effect on the Developing Permanent Dentition," by Richard E. Barnes of Cleveland, Ohio.

In keeping with the theme of earlier treatment was the paper entitled "Treatment of the Maturing Dentition," by Milton I. Braun of Chicago, Illinois.

At 6:30 P.M. the reception honoring President and Mrs. Howard Yost was held in the Terrace Room.

Following the reception, a dinner dance was held. Proof that this evening was fun was the fact that a large crowd stayed until the very end of the festivities.

Tuesday, October 4

The Tuesday morning session was devoted to a most interesting treatment panel. The moderator was John R. Thompson of Chicago, Illinois, and the panelists were: Copeland Sheldon of Kansas City, Missouri, Quentin Ringenberg of St. Louis, Missouri, and Thomas D. Speidel of Minneapolis, Minnesota.

Three cases were presented to the panel and audience by the following three men who had treated the cases: Lawrence W. McIver of Minneapolis, Minnesota, Raymond Thurow of Madison, Wisconsin, and William F. Ford of Chicago, Illinois. It was both interesting and instructive to observe the similarities and differences in the various approaches to treatment of the cases.

The ladies, again were the guests at a Continental Breakfast in the West Room of the Savery Hotel.

Following the 12 o'clock luncheon, President Yost again called the membership into business session.

William S. Brandhorst, chairman of the Special Committee to Study Transferral of Cases, reported progress in their deliberations and their desire to cooperate in bringing the matter to national attention.

Earl E. Shepard, chairman of the Committee to Study the President's Address, complimented President Yost upon the thoroughness and splendid manner in which he presented the facts of the organization to its members. Dr. Yost's recommendations pertaining to changes in the By-Laws of the A. A. O. and to the creation of a Council of Orthodontic Education were complimented and referred to the representative to the Board of Directors of the A. A. O.

Earl E. Shepard, chairman of the Nominating Committee, presented the following list of nominations, which was unanimously accepted:

President, Richard A. Smith, Evanston, Illinois.
President-Elect, Thomas D. Speidel, Minneapolis, Minnesota.
Vice-President, Frederick B. Lehman, Cedar Rapids, Iowa.
Secretary-Treasurer, William F. Ford, Winnetka, Illinois.
Representative to A.A.O. Board of Directors, P. M. Dunn, Minneapolis, Minnesota
Alternate, R. G. Bengston, Chicago, Illinois.
Sectional Editor, Charles R. Baker, Evanston, Illinois.
Member Board of Censors, James Hoffer, Des Moines, Iowa.
Member Publication Board, David Thompson, Elmhurst, Illinois.
Member Judicial Board, Henry Colby, Minneapolis, Minnesota.

At the close of the business session the newly elected members were installed by B. G. deVries.

At 1:30 P.M. the afternoon table clinic program began, and featured the following clinics:

1. Appliance Technique. James J. Guerrero, Chicago, Illinois.
2. A Simplified Means of Standardizing Your Photographic Technique. Frederick B. Lehman, Cedar Rapids, Iowa.
3. Crozat Type Appliance Using Cast Basic Framework. J. W. Norris, Burlington, Iowa.
4. Cephalometric and Laminographic Analysis of the Action of the Occlusal Guide Plane. C. G. Sleichter, Iowa City, Iowa.

5. Stainless Steel—Welding and Soldering. E. H. Hixon, State University of Iowa.
6. Adjuncts to the Face-Bow in Class II Cases. M. A. Hoghaug, Grand Forks, North Dakota.
7. Removable Appliances. W. E. Stoft, Omaha, Nebraska.
8. Let Us Look at Habits. D. J. Thompson, Elmhurst, Illinois.
9. Retracting Cuspids in Extraction Cases. Roger J. Fresdall, Minneapolis, Minn.
10. Acrylic Retaining and Bite Opening Appliance. Russell Ephland, Park Ridge, Illinois.
11. Use of a "Zoned" Appointment System. Karl von der Heydt, Oak Park, Illinois.

Certainly, the Des Moines meeting was one of the best meetings in the history of the Central Section and was attended by a total of 155 persons. Howard Yost is to be congratulated not only on the fine meeting, but also for having the foresight to appoint Jim Hoffer as the Local Arrangements chairman, who, in turn, had the foresight to be blessed with the fine Local Arrangements Committee which turned in a superb performance.

E. E. S.

Middle Atlantic Society of Orthodontists

The annual meeting of the Middle Atlantic Society of Orthodontists, held at the Shoreham Hotel, Washington, D. C., Oct. 5 to 7, 1955, featured Herbert I. Margolis of Boston, Massachusetts, Faustin Weber of Memphis, Tennessee, and Eugene J. Kelly of Trenton, New Jersey.

Dr. Margolis spoke on "Growth and Development of the Dento-Craniofacial Complex as Related to Treatment Planning and Mechanotherapy" and "Some Principles for Determining the Time and Selection of Teeth for Extraction When Indicated." Dr. Weber read a paper entitled "A Technique for Treating Extraction Cases Using Various Modifications of the Johnson Twin Arch Wire." Dr. Kelly spoke on "Advantages and Disadvantages of the Edgewise Appliance."

Clinics were given by Faustin Weber, Eugene Kelly, Walter Mosmann, Solomon Kessler, George Parrott, Jr., James Krygier, and the orthodontic staff of the Georgetown University Dental School (Lloyd, Splain, LeMense, and Crowley).

Discussion periods were provided at all scientific sessions, as is the rule in this Society.

The president's reception and buffet supper was held on Wednesday evening. A luncheon commemorating the centennial of Dr. Edward H. Angle's birth, June 1, 1855, featured Earl Swinehart (whose remarks appear in this issue of the JOURNAL) and a report from the honored guest, Philip E. Adams. On Thursday the Washington-Maryland members sponsored a cocktail party.

Officers elected for 1955-56 are as follows:

President, Daniel E. Sheehan.
President-Elect, Aubrey P. Sager.
Vice-President, Gerard A. Devlin.
Secretary-Treasurer, Paul A. Deems.
Editor, Stephen C. Hopkins.
Director, George M. Anderson.
Alternate Director, Kyrle Preis.

The next meeting is scheduled for Oct. 14, 15, and 16, 1956, at Haddon Hall Hotel, Atlantic City, New Jersey.

Pacific Coast Society of Orthodontists

OFFICERS AND COMMITTEES

President, Arnold E. Stoller, Seattle, Washington.
President-Elect, A. Frank Hemilich, Santa Barbara, California.
Vice-President, Richard M. Railsback, Oakland, California.
Secretary-Treasurer, Raymond M. Curtner, San Francisco, California.

The Northern Component meets on the second Tuesday of March, June, September, and December.

The Central Component meets on the second Tuesday of March, June, September, and December.

The Southern Component meets on the second Friday of March, June, September, and December.

CENTRAL COMPONENT

The meeting was called to order by Chairman Ben Ledyard on Tuesday, Sept. 13, 1955, at the Alexander Hamilton Hotel in San Francisco, California.

Prior to the business meeting and dinner, members and guests were able to examine a beautiful display of excellent treated cases and all their records. These were displayed by Jack Smithers, Hugh Carpol, and Wilden Ballard.

The following men, all Californians, were elected to *associate membership:* Maurice Bliss, San Mateo; Burton Coleman, San Jose; William Coon, Vallejo; Herbert Foster, Oakland; Robert Sprott, Napa; and James Thurston, San Leandro.

The following men were recommended for *active membership* by the membership committee, and their applications have been forwarded to Raymond Curtner for consideration by the Board of Directors: James Archer, Reno, Nevada; Oscar Bailey, Grass Valley, California; Robert Kemp, Fresno, California; Donald Light, Walnut Creek, California; Wilfred Wong, San Francisco, California; Edwin Tippett, San Francisco, California; and Rodney Johnson, San Francisco, California.

Raymond Curtner, Harry Carlson, and Glen Foor presented problem cases which, after good treatment, relapsed. A long question-and-answer period was conducted by our program chairman, Eugene West.

Dean Harold J. Noyes of Portland participated in a panel discussion relating to labor-management dental health care programs at the State Society Officers Conference on October 16 during the American Dental Association meeting in San Francisco.

SOUTHERN COMPONENT

The regular meeting was called to order by Chairman J. Clifford Willcox, Friday afternoon, Sept. 9, 1955, at the Huntington Sheraton Hotel.

After welcoming and introductory remarks, Clifford turned the meeting over to Roscoe Keedy, speaker of the afternoon, whose subject was "Basic Procedures of Treatment." Roscoe gave a very interesting and informative discussion of the history, development, and application of the edgewise appliance. During his presentation, he stressed the value of the principal types of appliances used today.

The social hour and dinner were followed by the evening program, which was devoted to the legal responsibilities and estate planning for the orthodontist. Mr. Kenneth A. Millard, well-known Southern California attorney, was the speaker.

NORTHERN COMPONENT

The Pacific N. W. Study Club just completed a very successful two-day meeting in Vancouver, September 10 and 11. Our guest clinicians were Cal Calmes and Vic Bowles

from Kansas City; they gave us a preview of the new bracket they have developed, which sounds promising.

Our next meeting was held in Seattle, October 31. Bob De Butts arranged the program.

Southern Society of Orthodontists

The Southern Society of Orthodontists held its annual meeting at the Charlotte Hotel in Charlotte, North Carolina, Sept. 25 to 28, 1955.

The Executive Board met for breakfast at 8:00 A.M. Sunday, Sept. 25, 1955, with a 100 per cent attendance. Business was transacted until 2:30 P.M., when there was a joint meeting of the Executive Board and committees. The meeting adjourned at 6:00 P.M. in order that the members might attend a buffet supper in the Ball Room of the hotel. This first social affair of the meeting was enjoyed by the members, ladies, and guests.

On Monday morning, September 26, the meeting was called to order in the Chelsea Room by President Owen. The invocation was given by Dr. C. C. Herbert, pastor of Myers Park Methodist Church. The welcoming address was given by Mr. Philip Van Every, Mayor of Charlotte, and the response was by William D. Curtis, Washington, D. C., vice-president of the Southern Society of Orthodontists. Following this, Olin W. Owen gave his presidential address. The work done by Dr. Owen during his year as president has been outstanding, and his address was excellent and well received by the members of the Society.

At 10:00 A.M. Philip E. Adams of Boston, Massachusetts, president of the American Association of Orthodontists, read a paper entitled "Diagnosis and Treatment Planning." The presentation outlined diagnostic criteria and methods at our command: models, histories, x-rays, photographs, and intraoral and extraoral cephalographics. It also stressed correlation and interdependence of various orthodontic records and the application of diagnostic findings to treatment planning. In the opinion of many, this was one of the most outstanding papers ever given on diagnosis and treatment planning. The paper was discussed by Prescott Smith and Roy Mitchell. A question-and-discussion period followed.

At noon the exhibits were open. Everyone enjoyed visiting the exhibits, and I am sure that the thirteen exhibitors, in turn, appreciated the courtesies they received from the members of the Society.

At 1:30 P.M. a paper entitled, "Financial Analysis of a Professional Man" was given by M. Jules King. Mr. King presented a financial analysis of a professional man, which included an analysis of his income and expenses and their relation to his business. The discussion was by Clyde Wells and a question-and-discussion period followed.

At 3:00 P.M. a paper entitled "The Clinical Application of the Edgewise Appliance in Orthodontic Treatment" was given by B. F. Dewel. This paper discussed indications for the edgewise appliance, with particular emphasis on its effectiveness in establishing stable anchorage, restoring vertical dimension, correcting rotations, and closing spaces following extraction in Class I discrepancy malocclusions and in Class II cases involving inadequate supporting structures. The discussion was opened by Sam Fennell and an interesting question-and-discussion period followed this paper.

At 5:00 P.M. buses left the hotel for dinner and entertainment at the Red Fez Club, a delightful spot on the Catawba River. Following a delicious dinner and excellent entertainment, the guests were returned by bus to the hotel.

Tuesday morning, September 27, at 9:30 A.M., a second paper, entitled "Business Management of an Orthodontic Practice," was given by M. Jules King. The paper discussed the management of an orthodontic practice from a business standpoint as related to the net profit and financial requirements. This discussion also included the philosophy and financial security for a professional man. The discussion was led by Leland Daniel, followed by a question-and-discussion period.

At 11 A.M. a business session was held. At this time reports of the secretary-treasurer, Executive Board, and committees, as well as a report on the presidential address, were heard. During this session the following officers were elected:

President, W. M. Jarrett, Charleston, West Virginia.
President-Elect, Frank P. Bowyer, Knoxville, Tennessee.
Vice-President, Thad Morrison, Sr., Atlanta, Georgia.
Secretary-Treasurer, Harold K. Terry, Miami, Florida.
Assistant Secretary, Charles H. Smith, Atlanta, Georgia.

Board of Directors:

John A. Atkinson, Louisville, Kentucky (chairman).
H. Harvey Payne, Atlanta, Georgia (assistant chairman).
M. D. Edwards, Montgomery, Alabama (new member of the Board of Directors).

Associate Editor, G. Fred Hale, Raleigh, North Carolina.

The members of committees are as follows:

Education Committee
Prescott E. Smith, New Orleans, Louisiana.
Bodine Higley, Chapel Hill, North Carolina.
Charles R. Crook, Montgomery, Alabama.

Public Relations Committee
James C. Brousseau, Baton Rouge, Louisiana.
H. D. Jaynes, Atlanta, Georgia.
William D. Curtis, Washington, D. C.

Necrology Committee
Doyle J. Smith, Memphis, Tennessee.
Glenn Phillips, Jacksonville, Florida.
Allan H. Cash, Charlotte, North Carolina.

Research Committee
Boyd W. Tarpley, Birmingham, Alabama.
William Weichselbaum, Jr., Savannah, Georgia.
W. A. Buhner, Daytona Beach, Florida.

Constitution and By-Laws Committee
Thomas Horton, Columbus, Georgia.
Burke Coomer, Louisville, Kentucky.
William H. Oliver, Nashville, Tennessee (re-elected to another term).

Immediately following the business session, a luncheon was held honoring new members and Philip E. Adams, president of the American Association of Orthodontists. Following a roll call, the new members were asked to proceed to the stage, where they were welcomed into the Society by Frank P. Bowyer, chairman of the Board of Directors. The new members are as follows:

Active:

Philip J. Bright, Jacksonville, Florida.
H. V. Davenport, Hickory, North Carolina.
Thorwald Eros, Jr., Atlanta, Georgia.
Robert J. Henns, Orlando, Florida.
Joseph L. Johnson, Charleston, South Carolina.
W. Burnie Bunch, Jacksonville, Florida.
William M. Ditto, Greensboro, North Carolina.
John M. Faust, Hattiesburg, Mississippi.
Charles H. Hopkins, Charleston, West Virginia.

Vernon C. Maggard, Lexington, Kentucky.
Andrew N. Mooney, Albany, Georgia.
Rubin Ruskin, Nashville, Tennessee.
A. Raymond Tannerbaum, Greensboro, North Carolina.
F. J. Tiblier, New Orleans, Louisiana.
Robert White, Florence, Alabama.
E. E. Mullinix, West Palm Beach, Florida.
Thomas C. Stults, Savannah, Georgia.
Wendell H. Taylor, Washington, D. C.
Lyman E. Wagers, Lexington, Kentucky.
Hugh O. Wrenn, Richmond, Virginia.

Associate:

Jerry W. Blackmer, Tampa, Florida.
Worth M. Byrd, Sanford, North Carolina.
D. H. Leventhal, Chattanooga, Tennessee.
S. H. Phillips, Greenwood, Mississippi.
Richard F. Schurer, Winston-Salem, North Carolina.
William O. Wimmer, Kingsport, Tennessee.
Ralph B. Congleton, Lexington, Kentucky.
Neil J. Leonard, Jr., Greenville, Mississippi.
Albert E. Miller, Bristol, Virginia.
William M. Selden, Louisville, Kentucky.
Joseph A. Wells, Greenville, South Carolina.

In addition to the above, Philip E. Adams, Boston, Massachusetts, was elected to honorary membership.

Following the luncheon, the afternoon session opened at 2:00 P.M., at which time B. F. Dewel presented a paper entitled "Serial Extraction as a Preliminary Corrective Procedure in Orthodontic Diagnosis and Treatment." Discussion was opened by William Buhner and a question-and-discussion period followed.

At 3:30 P.M. Philip E. Adams gave a paper entitled "Treatment Possibilities and Limitations," which was presented with slides, as were all the papers. Discussion was led by Boyd W. Tarpley.

On Wednesday, September 28, at 9:00 A.M. the following clinics were presented:

1. The Orthodontists' Role in Better Bridge Work.
   Dan B. Lewis, Owensboro, Kentucky.
2. A Clinical Technique for Treating Extraction Cases With the Johnson Twin Arch Wire.
   Faustin N. Weber, Memphis, Tennessee.
3. Transferring Cases.
   Thad Morrison, Jr., Atlanta, Georgia.
4. Orthodontics for the Adult.
   Marvin C. Goldstein, Atlanta, Georgia.
5. Elastic Thread.
   William A. Buhner, Daytona Beach, Florida.
6. Orthodontics as an Aid in Treatment of Periodontal Cases.
   William H. Oliver, Nashville, Tennessee.
7. Interdental Wiring Technic.
   W. Ross Williams, Birmingham, Alabama.
8. The Role of the Orthodontist in the Rehabilitation of the Cleft Palate Patient.
   Thomas D. Pryse, Knoxville, Tennessee.
9. Most With the Least.
   Elbert M. Upshaw, Atlanta, Georgia.

10. Simplified Method of Taking Locked Teeth Out of Occlusion During Treatment.
W. J. Turbyfill, Asheville, North Carolina.
11. Stainless Steel Bands.
Howard L. Wellins, Miami, Florida.
12. A New Head Positioner for Serial Temporomandibular Joint and Cephalometric Radiography.
W. A. King, New Orleans, Louisiana.
13. Orthodontics With Surgical Treatment of a Class III Malocclusion (a fifteen-minute color movie).
A. A. Phillips, Raleigh, North Carolina.
14. Use of the Stabilizing Plate in Treatment.
L. B. Higley, Chapel Hill, North Carolina.
15. Cephalometrics in Diagnosis.
R. M. Nelson, Chapel Hill, North Carolina.
16. New Method of Retaining.
R. E. Allen, Jacksonville, Florida.

Following the clinics, there was a drawing for attendance prizes. Next, a business session was held, at which the new officers were installed, and following this the meeting was adjourned. Registration for the meeting was as follows:

Members present	104
Associates	27
Guests	29
Wives	75
Exhibitors	13
Total	248

We have a total membership of 210, as follows:

Active	179
Associate	11
Affiliate	12
Honorary	7
Retired	1
	210

We had an excellent meeting and a good attendance, and a good time was had by all. Congratulations again to Olin Owen and his Local Arrangements Committee for the wonderful meeting.

Oren A. Oliver

Southwestern Society of Orthodontists

Under the leadership of President J. Victor Benton, the Southwestern Society of Orthodontists held its annual meeting on Oct. 18, 1955, in Wichita, Kansas.

Robert W. Donovan, Evanston, Illinois, presented the following lectures:

1. USING OUR RESEARCH FINDINGS IN CASE ANALYSIS AND TREATMENT PLANNING. Classification of some of the basic problems in the treatment of dental malocclusion and how the practical application of research findings in cephalometrics, skeletal analysis, denture analysis, formal growth, and electromyograph might aid the orthodontist.

2. MAKING THE EDGEWISE ARCH APPLIANCE WORK FOR US. A complicated multiband technique must accomplish a task better and faster to justify its use. A suggestion for raising the efficiency of the edgewise arch mechanism (the most result for the least investment of time and effort).

3. Treatment Before and After the Teens. Serial extraction and preliminary periods of treatment might solve many of our problems. Adults deserve more orthodontic consideration, not only for esthetics, but primarily for functional problems.

Faustin N. Weber, D.D.S., Memphis, Tennessee, presented the following lectures:

1. The Technique of Treating Extraction Cases Using Various Modifications of the Johnson Twin Arch Wire. Discussion of the various appliance modifications.

2. The Clinical Application of the Modifications Given in the Previous Lecture.

3. Interceptive Orthodontics. The interception and prevention of some types of malocclusion.

Case Report of a Difficult Double Protrusion. Wade Clendenen, D.D.S., Longview, Texas.

A report was submitted by the Advisory Committee, as follows:

> The Advisory Committee met in special session. Regarding requirements for membership in the American Association of Orthodontists, the committee recommends that this Society go on record as favoring the further study of the requirements for membership in the A.A.O.
>
> Respectfully submitted,
> John W. Richmond (Chairman)
> Bibb Ballard
> Robert E. Gaylord.

The above report was passed unanimously and the secretary was instructed to send copies to officers and interested committees of the A.A.O.

Pertaining further to this subject, a progress report was made by Brooks Bell, co-chairman of committee appointed by the President of the A.A.O. to work out other methods of becoming a member of the A.A.O. (in addition to the amendment to the by-laws passed in San Francisco which provides that only applicants who have enjoyed 1,500 hours of orthodontic instruction in a university are eligible for membership). The report follows:

> As you know, an amendment to our A.A.O. By-Laws was passed in San Francisco whereby, beginning in May of 1957, only those who have had 1,500 hours of orthodontic instruction in a university can become active members of the A.A.O.
>
> Feeling that this method of obtaining active membership was much too restrictive, a motion was made, which was seconded by Dr. John Thompson (Chairman of the original Committee on Requirements for Membership), that a committee be appointed to work out other methods for becoming an active member of the A.A.O. President Adams appointed this committee and the following are the members: Andrew Francis Jackson of Philadelphia, Ernest N. Bach of Toledo, and George W. Hahn of Berkeley; John Thompson and I are co-chairmen.
>
> This committee has received many suggestions concerning preceptorship training. Among them are the following:
>
> (1) Preceptorship training shall consist of two or three or four years.
> (2) Preceptorship training shall be in the office of (a) a diplomate of the American Board of Orthodontics or (b) any member of the A.A.O. who has been a member of the A.A.O. not less than seven years.
> (3) During the period of preceptorship training, the trainee shall read at least (1) three or (2) four texts on orthodontics. He shall submit a brief condensation of each text to the Admissions Committee of his component society.
> (4) At the end of his preceptorship, the trainee shall present twenty various pieces of technique to the component society's Admissions Committee.

One other suggestion was that the period of specialization in orthodontics be increased from three years to five years before A.A.O. membership is possible.

Incidentally, this amendment on preceptorship training will be submitted in Boston and voted on in New Orleans.

In the meantime, we will appreciate your ideas on this amendment. Please talk with me here or write me in the next few weeks.

E. B. Arnold Presented Dewey Award by Southwestern Society of Orthodontists

At the annual meeting of the Southwestern Society of Orthodontists in Wichita, Kansas, Oct. 18, 1955, Paul G. Spencer made the following presentation of the Martin Dewey Memorial Award to E. B. Arnold of Houston, Texas:

This Society has set up a plan and established ways and means for the annual presentation of the Martin Dewey Memorial Award as an expression of appreciation of efforts to aid the progress and development of orthodontics. On these occasions an opportunity is provided to pay respect to the memory of the late Dr. Dewey, who was, for many years, a regular and constant attendant at our annual meetings and who was elected as one of our first honorary members. While refusing any remuneration, he served as one of the foremost essayists on many of our programs. His basic objective was to incite each of us to study and to accept only that which is definitely supported by factual evidence. He enjoyed our companionship and friendly informality.

It is evident that, as yet, the field of orthodontics is not in reality a science, even though the term is commonly applied and generally accepted. Nor will it become one until the supposition and the confusion arising from conflicting theories have been cleared away. There are many paths that lay claim to the same objectives, but only those that comply with and abide by the biologic plan provided by Mother Nature will endure.

In a period of three and one-half decades we have attained a very high degree of skill, mechanically; however, if mechanics is considered the complete solution of all orthodontic problems, then successful treatment will always be a certainty and "relapse" will become an obsolete word.

There may be among our younger members, perhaps, some who do not know or fully realize some of the factors which were so important in our formative years in guiding us to our present position of attainment. Our principal objective has always been to seek and obtain more knowledge in the practice of our specialty. This was made possible, to some degree, through a spirit of cooperation and good fellowship among the members. Another factor in the success of this Society has been our freedom to debate, to discuss, and to permit complete tolerance of all methods of practice. It is fortunate that opinions do differ, so long as, by trial and error experience, we accept the credible and discard the worthless qualities of all methods.

It has often been said that "the worker is worthy of his hire," which is very true, provided that the Golden Rule is always applied. Monetary gain is not always a sign of proficiency; sometimes it is only the result of opportunity. There is only a small margin of difference between a premise that is legally permissible and one that is morally wrong; however, each may give birth to a racket and bring discredit to a health service which has a worth-while record of achievement.

It is a pleasure, and certainly a privilege, to join with all the members of the Southwestern Society of Orthodontists in presenting the Martin Dewey Memorial Award to E. B. Arnold.

It will take many years for this Society to honor all those who merit this award, but never will your selection be more deserving than is this member whom we affectionally know

as Eddie. As a charter member of this Society, he has given freely of his time and talents to the advancement of orthodontics. As a constant and diligent worker, he has sought to know not only the "how" and "what" of orthodontic problems, but also the "why," which is the credo of the perfectionist. Time does not permit the listing of the good qualities which Eddie possesses, professionally or otherwise. Besides, those who know and love him would make additions to any list that might be stated here. Suffice it to say that he is a credit to his profession and to his religion, a devoted husband, and the father of a fine family. I consider it a bright spot in my life to have known Eddie and to be called his friend.

P. G. S.

Brooks Bell, representing the Award Committee, made the following remarks:

The recipient of the 1955 Dewey Award—Edmond B. Arnold—is a native Texan, having been born in Galveston, Texas, in 1896. He was graduated from Washington University in St. Louis in 1919 and also from the Dewey School of Orthodontia in the same year. He then opened his office in Houston, where he has established a brilliant reputation. Among the many contributions that Ed Arnold has made to orthodontics is the Arnold coil sping which has become widely used in many variations.

EDMOND B. ARNOLD, RECIPIENT OF THE MARTIN DEWEY MEMORIAL AWARD.

Dr. Arnold was certified by the American Board of Orthodontics in 1931. He is a past-president of the Southwestern Society of Orthodontists and the Harris County Dental Society, a fellow of the American College of Dentists, and a member of the Omicron Kappa Upisilon and Delta Sigma Delta dental fraternities. He served on the faculty of the Texas State Dental College for twenty-nine years.

It is with a great deal of pleasure that the Dewey Award Committee, acting on behalf of the Southwestern Society of Orthodontists, presents the Martin Dewey Memorial Award for 1955 to Dr. Edmond B. Arnold.

The award certificate reads "The Martin Dewey Memorial Award, presented by the Southwestern Society of Orthodontists to Edmond B. Arnold in recognition of outstanding contributions to the advancement of Orthodontics."

In accepting the Martin Dewey Memorial Award, Dr. Arnold made the following remarks:

I do not know why I was selected to receive this award, which I consider a great honor. I wish to thank any and all who had anything to do with selecting me.

Dr. Dewey taught not only the mechanics of orthodontics as far as appliances were concerned, but also the histology and physiology of bone (such as the part played by the osteoblasts and osteoclasts in tooth movement and the results of same), as well as the functions of the periosteum and periodontal membrane. I am afraid that we, in the present day, are forgetting much of this. Fellow practitioners, we are dealing with human beings and, therefore, with living and growing tissues which we must constantly think of in orthodontic treatment.

If I have helped anyone in orthodontics I am very happy, for in so doing I have helped humanity by helping my fellow practitioners in correcting the malocclusions and facial deformities of their patients. This, to me, is something that we, as professional men, should not have to be awarded for; nor should we consider the monetary reward. May I quote from Maimonides' prayer: "May the love of my work actuate me at all times, may neither avarice nor miserliness, nor the thirst for glory of a great reputation engage my mind—Endow me with strength of heart and mind so that both may be always ready to serve the rich and the poor, the good and the wicked, friend and enemy. If physicians more learned than I wish to counsel me, inspire me, O God, with confidence in, and obedience toward the recognition of them, for the study of science is great, it is not given to one alone to see all that others see."

May I quote further the first paragraph of Hippocrates' Oath: "I swear by Apollo the physician, and Aesculapius, and Health, and All-heal, and all the gods, and goddesses, that, according to my ability and judgment, I will keep this Oath and this stipulation—to reckon him who taught me this art equally dear to me as my parents, to share my substance with him, and relieve his necessities if required; to look upon his offspring in the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction, I will impart a knowledge of the art to my own sons, and those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to none others."

In closing, I wish to quote a line or two from the Good Book: "Everyone that exalteth himself shall be humbled, and he that humbleth himself shall be exalted."

Thank you very much for your attention.

Brigadier General Leigh C. Fairbank, Retired, Receives Military Award for 1955

Presentations were made of military awards and honors in Washington, D. C., Nov. 9, 1955. Among other awards, the Founders Medal authorized by the executive council of the Association of Military Surgeons was presented to commemorate the fiftieth anniversary of the founding of the Association. The award is given each year for outstanding contribution to military medicine and conspicuous service to the Association. Among those chosen this year was the well-known orthodontist and former chief of the Dental Division of the United States Army, Brigadier General Leigh C. Fairbank, DC, Retired, of Washington. The Founders Medal was also conferred upon two medical officers. They were Brigadier General John R. Wood (MC) USA, Commandant, Army Medical Service Graduate School, Walter Reed Army Medical Center, Washington, D. C., and Colonel Louis F. Saylor (MC) USA, Office of the Surgeon General, United States Army, Washington, D. C.

Join the Battle for Truth

Send Your Books and Magazines Abroad

President Eisenhower has said, "We must, through a vigorous information program, keep the peoples of the world truthfully advised of our actions and purposes." Carrying out this objective is primarily the job of the United States Information Agency.

Because of the immensity of this task, however, and because the Soviet Government and its satellites are spending some twenty times as much on propaganda as our Government is in telling the truth about America, Uncle Sam needs the help of all Americans in backstopping this effort.

One of the most effective means for telling the American story is through books and magazines shipped overseas and placed in libraries where they may be read by our friends and potential friends abroad. We are told that the need for these publications is so great that they are literally thumbed to shreds when placed in overseas libraries.

The Government is seeking the aid of all citizens and groups in this vital book and magazine collection campaign. Thousands of dentists have at their disposal books and magazines which could be used in this vital campaign. After your publications have been read, please do not discard them. Technical, popular, and pictorial magazines are in great demand in many areas of the world. The same is true of books, both technical and fictional.

Magazines for overseas use, however, should be fairly well up to date and in good condition. Lurid and sensational publications, of course, should not be sent abroad.

Magazines and books may be either mailed directly to friends overseas or shipped abroad for general distribution. In the latter case, they should be sent to the U. S. Book Exchange, Inc., 1816 Half St., S. W., Washington 4, D. C.

Notes of Interest

Dr. Theodore Adler announces the removal of his office to the Professional Building of White Plains, 280 Mamaroneck Ave., White Plains, New York, practice limited to orthodontics.

R. M. Courtney, D.D.S., and C. L. Rister, D.D.S., announce the association of L. Hood Harris, D.D.S., University Club Bldg., St. Louis, Missouri.

Paul Dimenstein, D.D.S., announces the removal of his office to 1714 Eleventh Ave., South, Birmingham, Alabama, practice limited to orthodontics.

Robert J. Gawley, D.D.S., announces the association of Joseph Hyman, D.D.S., and also the moving of their offices to 1212 East Main St., Alhambra, California.

Judah M. Horowitz, D.D.S., announces his return from service in the Army Dental Corps and the reopening of his office at 338 East 5th St., Brooklyn, New York, practice limited to orthodontics.

William S. Parker, D.M.D., announces the removal of his office to 2430 L St., Sacramento, California, practice limited to orthodontics.

Arthur Siegel, D.D.S., announces the opening of his offices for the practice of orthodontics, 216B Midtown Bldg., 116 East Sewells Point Rd., Norfolk, Va.

George H. Wern, D.D.S., M.S.D., announces the removal of his office for the exclusive practice of orthodontics to 500 West 15th St., Austin, Texas.

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